THE BATS OF SURINAME

by

A. M. HUSSON
(Rijksmuseum van Natuurlijke Historie, Leiden)

With text-figures 1-39 and plates I-XXX

CONTENTS

I. INTRODUCTION

A. Scope of the present paper

The object of this publication is to give an account of the present state of our knowledge concerning the taxonomy of the bats inhabiting Suriname

(Dutch Guiana). As a matter of fact only part of the species of Chiroptera occurring in Suriname are known. Though the coastal region north of the anterior mountain range and particularly the area east of the Saramacca and Suriname Rivers has been relatively well explored as far as the chiropterological fauna is concerned, there are very few data on the occurrence of bats in the interior parts of Suriname, which in future undoubtedly will prove to contain many species besides those known at present.

The deficiency of data referred to above becomes especially apparent when we take into account that Greenhall (1959b), in his list of the Chiroptera of the Guianas, enumerated 107 species of bats, while up to the present only 61 species are known from Suriname. Though not all species of Greenhall's list can be expected to occur in Suriname (the list is based on records from the literature only and some species have been inserted merely for zoogeographical reasons, whereas the systematic position of some others is questionable) it is indisputable that after a careful investigation of the fauna of Suriname the number of species of bats known from that country will increase.

The present paper gives a review of the Suriname bats on the basis of the material and the literature available at this moment, and is intended as a basis for future investigations. It is hoped that this review will prove to be a stimulus for a more intensive collecting and study of the Suriname bats, and eventually will lead to the preparation of a handbook for a certain and easy identification of the species concerned. Such a handbook is highly desirable, now that the bat-transmitted rabies has come in the centre of interest of members of the medical and of the veterinarian professions. In very recent years, namely, a type of rabies became epidemic among horses and cows in the so-called Santozwamp, situated about 10 km south-west of Paramaribo. It proved that this rabies strain was transmitted by vampire bats of the family Desmodidae and by other species of bats of which the identity was unknown (see Collier & Tiggelman-Van Krugten, 1955; Langeler, 1955; Anonymus, 1955). It is evident that the problem of bat-transmitted diseases is of direct concern to Suriname public health and also to the welfare of Suriname live-stock. Consequently it is necessary that the scientific staffs of hospitals and laboratories should be able to distinguish the various forms of bats and to name the species correctly in order to compare the results of their investigations with those of other scientists in the same field. However, it is not only desirable to know the correct name of the examined specimens of bats, but for an eventual control of them it is necessary to know data on their biology, their ecology, the density of the several populations, and their exact distribution in Suriname. As pointed out on pages

18-25 hardly anything is known about these subjects, since investigations on Suriname Chiroptera based on modern methods and principles are lacking. Unfortunately there are no comprehensive publications on the mammals of the two other Guianas, which might lead to the determination of the bats of these areas; the important papers of Vieira (1942) on Brazilian bats and of Goodwin & Greenhall (1961) on Trinidad and Tobago bats are at present in this respect the most useful available. Besides the data of systematical interest Goodwin & Greenhall give detailed information concerning the occurrence, breeding, food, parasites, and diseases of the bats dealt with. It is evident that the checklist of Cabrera (1958, pp. 48-133) of the mammals of South America is indispensable for taxonomic investigations on Suriname bats, though in many cases this list must be used with some reserve, because some groups of neotropical bats require a critical revision.

The first data on Suriname bats are to be found in old narratives and in descriptions of the former Dutch Colony of Suriname. The first part of chapter II gives, amongst other things, a survey of this old literature. For the motivation of such a chapter the view of the economist Keynes (1926, p. 16) may be cited here: "A study of the history of opinion is a necessary preliminary to the emancipation of the mind. I do not know which makes a man more conservative — to know nothing but the present, or nothing but the past". The second part of chapter II mainly deals with data on the biology of Suriname bats as found in the literature. It is hoped that after a few years a more extensive outline can be provided of the biology of Suriname bats based on field studies.

Chapter III treats of the taxonomy of the Chiroptera known at present from Suriname. Here all the species of which I have seen Suriname material, or which have been reported from Suriname, are treated more or less extensively. Species that are known to occur in French Guiana as well as in British Guiana but have not been reported from Suriname, are included in the keys only, with a short account of their characters, to draw the attention to the possible occurrence of these species in the area under consideration. Species known only from either French or British Guiana are not included in the key, as the possibility of the occurrence in Suriname of such species is much smaller. An exception is, however, made for *Diaemus youngii youngii,* originally described by Jentink (1893, pp. 282-283) from British Guiana, and for *Phylloderma stenops,* described by Peters (1865b, p. 513) from French Guiana, because of both species the holotypes are present in the Leiden Museum; to my knowledge no skull measurements of these species have been published before. These measurements are here given as well as some additional remarks on the skins and the skulls.

Under each species treated in Chapter III a reference is given to the original description and to those publications in which Suriname material of the species is dealt with. No lists of synonyms are provided, for these can be found in the revisions of the various groups or in the checklist published by Cabrera (1958). In the paragraph "Type locality" the type locality of the species as given in the original publication is cited; if necessary, restrictions of the locality by later authors are also dealt with here. Under the heading "Distribution" the general distribution of the species is given, without further details. The paragraph "Specimens examined" lists all the Suriname material of the species that I examined. In a few cases, e.g., when no Suriname material was at my disposal or with rare species, also material from outside Suriname is listed. If not otherwise indicated, however, all localities mentioned form part of Suriname. Under the heading "Description" references to a published description both of the animal and the skull are given, followed by a short diagnosis in which the striking characters are mentioned and by some external and skull measurements of the examined specimens. Under "Remarks" all other informations are given which are not dealt with in the foregoing paragraphs. Because the old narratives and descriptions of the former Dutch Colony of Suriname often are rare or difficult to consult, complete citations of the text dealing with bats from such publications are given in the present paper.

The present publication is rather profusely illustrated. It was thought advisable to give figures of the heads of several of the species because it is difficult to exactly describe the shape of the facial area, of the nose leaf, and of the ear, while a figure shows at once the characteristic peculiarities. The skulls of fifty-six species are represented on the plates II-XXX, here of each species there is a photograph of the skull in side view, of the mandible (generally of the left side), of the dorsal and of the ventral surface of the skull. Characters of the skulls that become at once apparent from the figures are as a rule not mentioned in the text. The shape and the arrangement of the incisors and the canines in many cases may lead to a rapid identification of the species. As the exact structure and arrangement of these teeth does not appear in sufficient detail in the photographs several drawings of these teeth, in front view in their position in the jaws, are here given. As an example the attention may be drawn to fig. 19, in which the dental characters of four genera of Glossophaginae become at once apparent. Up to the present too little attention has been paid to the interfemoral membranes of bats. It proved that in many cases these membranes may yield important characters for the distinction of large groups, of genera, and even of species. The diagrams of the inter-

femoral membranes as they are given in the present paper need the following explanation. For these diagrams a single basis figure showing the outline of the lower part of the body and the hind legs is used. Therefore differences in the proportions of the various parts of the legs in the different species could not be taken into account. Consequently some inaccuracies in these figures could not be avoided. However, the attachment of the wing membranes is always accurately shown, as well as the extent of the interfemoral membrane in relation to the length of the hind legs, the length of the tail in relation to the width of the interfemoral membrane, and the length of the calcar in relation to the free margin of the interfemoral membrane. Finally it was thought useful to copy some of the old figures of bats, especially those of Seba, which have given rise to many comments in the literature.

In the present paper the arrangement of families and genera is that adopted by Miller (1907a), a system which was accepted by most subsequent authors, though sometimes with a few modifications. Recently, however, Dalquest & Werner (1954, p. 159) suggested the possibility of a new arrangement of the families of American and West Indian bats, based on the presence or absence of sudoriferous glands in the facial areas of these animals, which arrangement in their opinion will be "more nearly the true phylogenetic order than that adopted by Miller".

B. Measurements

The external as well as the skull measurements are given in millimetres, if not otherwise indicated. With the length of the forearm is meant the distance between the midpoint of the elbow and that of the wrist measured on the dorsal side of the folded wing (see Husson, 1960, p. 23 fig. 3). The length of the forearm as well as the skull measurements were taken with a vernier calliper to the nearest tenth of a millimetre. The length of the hind foot as given here includes the claws. The length of the ear is taken from the external meatus. I am aware of the fact that this length in most cases cannot be accurately measured, at least not in spirit specimens; the only object for giving this measurement is to indicate the approximate size of the ears, it has no other value. The skull measurements need no further explanation, because they are those adopted by most modern authors (see Hall, 1946, p. 679 figs. 482 and 483; Handley, 1959, pp. 98-99, fig. 1). As the width across the molars I have consistently indicated the greatest width, whether that is across the second or across the third molars. As the length of the mandible I have taken the distance between the anteriormost projection of the mandible (excluding the incisors) and the posteriormost projection of the processus condylicus (= processus articularis).

C. Nomenclature

Several problems of a nomenclatorial nature arose during the present study. They have been solved in accordance with the rules laid down in the "1961 International Code of Zoological Nomenclature adopted by the XV International Congress of Zoology, published for the International Commission on Zoological Nomenclature by the International Trust for Zoological Nomenclature" (London, xviii + 176 pp.), which hereafter will be indicated as the "Code". Where my conclusions result in the use of names differing from those currently adopted for the same taxa, I have explained my reasons. Three problems of a more general nature may be dealt with here, all of which concern author's names.

(1) There exists no uniformity in citing the name of Maximilian, Prinz von Wied-Neuwied, who described some birds and mammals from Brazil, e.g., *Rhynchonycteris naso*. His name as the author of such species is variously cited by later mammalogists as Maximilian, Pr. zu Wied, Wied, Von Wied-Neuwied, and Wied-Neuwied. In the "Catalogue of birds of the Americas and the adjacent Islands" (Field Mus. Nat. Hist., Zool. Ser., vol. 13, 1918-1949) the name Wied is consistently used. In my opinion it is recommendable to follow this practice.

(2) A similar problem is that of the use of the names E. Geoffroy Saint-Hilaire or simply E. Geoffroy; since, as far as known to me, most authors cited the well-known French mammalogist as E. Geoffroy, I follow this practice.

(3) There are zoologists who consider Johann Natterer to be the author of the new species, which Wagner in his 1843 paper "Diagnosen neuer Arten brasilischer Handflügler" provided with the author's name Natterer. Since nowhere in Wagner's paper it is made clear that Natterer is responsible for both the name and the description of these new species, Wagner must be cited as the author (Code, Art. 50, p. 49). It is possible — and Wagner's (1843, p. 365; 1845, pp. 121-123) various remarks make this highly probable — that Wagner made the descriptions, but that the names are manuscript names provided by Natterer.

(4) For the same reasons as those mentioned under (3) some new species described in Schinz's "Thierreich" (1821) with the author's name "P. Max." must be cited with Schinz as the author and not Wied, since nowhere in Schinz's book there is any indication that the descriptions are by anyone else but Schinz himself. It must be noted that Wied in his 1826 paper extensively dealt with these species, and clearly considered himself to be the author of *Phyllostoma macrophyllum* [= *Macrophyllum macrophyllum*] (as appears

from his remark on page 192: "Diese Fledermaus, welche ich in keinem zoologischen Werke beschrieben finde, bildet eine sehr characteristisch ausgezeichnete Species"; on the other hand it seems peculiar that Wied did not note that he provided Schinz with a short description of this form.

D. Acknowledgements

For the present study material was available from the following institutions:

AMNH — American Museum of Natural History, New York.
BMNH — British Museum (Natural History), London.
CNHM — Chicago Natural History Museum, Chicago (Illinois).
MNHN — Muséum National d'Histoire Naturelle, Paris.
RMNH — Rijksmuseum van Natuurlijke Historie, Leiden.
SMN — Staatliches Museum für Naturkunde, Stuttgart.
ZMA — Zoölogisch Museum, Amsterdam.
ZMB — Institut für Spezielle Zoologie und Zoologisches Museum, Berlin.
ZMH — Zoologisches Museum, Hamburg.

I am most grateful to the authorities of the above mentioned museums for the privilege of studying the Suriname Chiroptera in their collections. Furthermore I wish to express my sincere thanks to the following persons for most valuable information and for generous help received during the present study: Mr. P. J. H. van Bree (Amsterdam), Dr. C. F. A. Bruijning (Leiden), Dr. H. M. Van Deusen (New York), Dr. J. Dorst (Paris), Professor Dr. M. Eisentraut (Stuttgart; at present Bonn), Mr. P. J. van der Feen (Amsterdam), Dr. Th. Haltenorth (Munich), Mr. R. W. Hayman (London), Dr. Ph. Hershkovitz (Chicago), Mr. J. E. Hill (London), Dr. A. Kleinschmidt (Stuttgart), Mr. H. Knorr (Stuttgart), Dr. Erna Mohr (Hamburg), Mr. J. Roche (Paris), Dr. G. H. W. Stein (Berlin), Dr. Ingrid Weigel (Münich), Professor Dr. K. Zimmermann (Berlin). A special word of thanks is due to Dr. D. C. Geijskes, Director of the Surinaams Museum at Paramaribo, who not only stimulated me to undertake and to finish the present study, but also sent most important collections of Suriname mammals to the Leiden Museum. These collections, which were assembled by him and his collaborators in various parts of Suriname, formed the basis for the present work.

I am greatly indebted to Dr. L. B. Holthuis for valuable advice concerning the several nomenclatorial problems that presented themselves during the course of the investigations.

If not indicated otherwise the text-figures were made by Mr. W. C. G. Gertenaar and Mr. H. Heijn of the Rijksmuseum van Natuurlijke Historie at Leiden. The illustrations of the heads were made after spirit specimens. Of some of these the skull had been removed before the animal was drawn. I fully realize that these drawings cannot be entirely satisfactory, since a reconstruction of various features that have changed because of the preservation is extremely difficult. The photographs of the skulls of pls. II-XXX were made by Mr. H. F. Roman of the Leiden Museum. Wherever possible the photographs show Suriname specimens; here the choice was rather limited and the skulls used are not always in perfect condition.

A subvention of the Netherlands Organisation for the Advancement of Pure Research (Z.W.O.) enabled me to visit in 1961 the Museums in Stuttgart, Münich, and Paris for the study of South American mammals.

II. GENERAL PART

A. History of the study of Suriname bats

In many old narratives and in descriptions of the former Dutch Colony of Suriname data are found concerning the bats of this region. Most of these publications have appeared in several editions, some of which being translations of the original. Here only the original edition and in some cases the Dutch version are cited. For a better understanding of the following discussion I may remark that many of the authors while dealing with the blood-sucking habits of the vampire bats, ascribe these habits in more or less detail to the large but in this respect harmless *Vampyrum spectrum* (L.). This subject will be extensively discussed under that species and under *Desmodus rotundus* (E. Geoffroy). In his paper on the Crustacea Decapoda of Suriname, Holthuis (1959, pp. 4-41) elaborately dealt with the life and work of persons who collected Decapoda in Suriname, and with several expeditions which were sent out to explore parts of this country. Several persons dealt with by Holthuis are also of interest for their contributions to the knowledge of the Suriname Chiroptera, namely (in parentheses the page of Holthuis's paper containing the informations): J. D. Herlein (p. 6); P. A. Fermin (p. 7); E. Bancroft (p. 8); J. J. Hartsinck (p. 9); J. G. Stedman (p. 9); A. von Sack (p. 9); M. D. Teenstra (p. 10); P. J. Benoit (p. 10); A. Kappler (p. 10); A. Seba (p. 11); G. D. Collin (p. 12); H. H. Dieperink (p. 21); J. H. Spitzly (p. 26); D. G. J. Bolten (p. 27); M. D. Horst (p. 28); C. Heller [1]) (p. 29); W. C. van Heurn (p. 29); I. T. Sanderson (p. 30);

1) Since the publication of Holthuis's paper the following additional information on Heller was received from the Evangelische Broedergemeente, Zeist, Holland: August

H. W. C. Cossee (p. 30); D. C. Geijskes (p. 31); F. Haverschmidt (p. 32); J. C. Lindeman (p. 32); and C. F. A. Bruijning (p. 33). The following expeditions are discussed by Holthuis: 1900 Nickerie Expedition (p. 35); 1901 Coppename Expedition (p. 35); 1902-1903 Saramacca Expedition (p. 36); 1903-1904 Gonini Expedition (p. 36); 1910-1911 Corantijn Expedition (p. 37); 1922 Expedition to Hendrik Mt. (p. 38); 1926 Expedition to the Wilhelmina Range (p. 38); 1948-1949 Suriname Expedition (p. 39); 1952 Medical Expedition to the southern border region (p. 40). The 1958 Expedition to the Tafelberg has been extensively discussed by Geijskes (1959).

As far as known to me Warren (1667, pp. 9, 10, and 21-22) was the first author who gave some information on Suriname bats. On page 9 he remarked: "*Hogs* would increase infinitely, did not the *Bats,* Retard it, by Biting off their Teats"; and on page 10: "I would have added something of the *Bat,* but it being disputable whether it belongs to Birds or Beasts, I refer it to my Description of things hurtful, being a place more proper for it than either of the former, with which, *Surinam* is so well and variously stored, that I think no place whatsoever, can, with more Reason, brag of its Excellency in this kind, and it is almost as easie to enumerate the Stars of Heaven as their several Species". On pages 9, and 21-22 Warren mentioned the occurrence of blood-sucking bats; according to his words "Some seem as big as *Pigeons* in their flight", the author meant *Vampyrum spectrum.* In the Dutch 1669 version these citations are found on pages 9, 10, and 17.

The second part of Van Berkel's 1695 (pp. 107-239) "Amerikaansche Voyagien" (American Voyages) deals with "Reis na Suriname" (Voyage to Suriname). On pages 117 and 129 this author copied the Dutch version

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Oswald Constantin Heller (born Gnadenfrei, Germany, 17 November 1846, died Görlitz, Germany, 26 June 1917), son of a businessman in Gnadenfrei, became apprentice to a carpenter. Between 1866 and 1871 he spent most of his time in the army, taking part in the Franco-German war of 1870-1871. In 1871 he decided to become a missionary and got his education to this end in Niesky, Germany. In 1874 Heller went as a missionary to Labrador, returning to Germany in 1878. He left the service of the mission and became a schoolteacher and also worked as a carpenter. In 1883 he decided to become again a missionary, and after having married he left for Suriname in December of the same year, arriving in Paramaribo in the end of January 1884. The next few years were spent in Paramaribo, in 1889 the Hellers went to Charlottenburg, and one year later to Berg en Dal from where he also visited Gansee and Koffiekamp. In 1891 Heller and his family had to return to Europe for reasons of health, but in 1892 Heller, his wife, and two children returned to Suriname, staying there till 1904. In this second period Heller was stationed at Heerendijk, Nieuw-Nickerie, Charlottenburg, Bersaba, Bethesda, and Albina. After having been in Europe from 1904 to 1908, Heller went for a third time to Suriname in 1908 and stayed there till 1911 when he and his wife returned via the U.S.A. to Germany.

of Warren's book (1669, pp. 9, and 17) literally, though he did not cite Warren's name.

Herlein (1718, p. 178) mentioned only the occurrence in Suriname of blood-sucking bats, which should be as great as pigeons [= *Vampyrum spectrum*]. Actually though not mentioning that author he gives an abstract of the observations made by Warren. The same can be said of Pistorius (1763, p. 73).

The first scientific publication containing information on Suriname bats is the first volume of the "Locupletissimi Rerum Naturalium Thesauri accurata Descriptio" by Albert Seba (1734), an Amsterdam apothecary of German descent, who possessed a large cabinet of natural curiosities. In his book Seba gave of each animal a Latin description followed by a translation in French; ten specimens of bats have been figured, four of these being of interest for the chiropteran fauna of South America. On pp. 89-90 Seba described his "Vespertilio, Cato similis, Americanus", and figured it on plate lv fig. 1 (cf. fig. 7 in the present paper); Linnaeus (1758, p. 32) referred to this figure under *Vespertilio leporinus* [= *Noctilio leporinus*]. On p. 90 Seba described "Vespertilio, Americanus, vulgaris" and figured it on plate lv fig. 2 (cf. fig. 22 in the present paper); on this species Linnaeus (1758, p. 31) based his *Vespertilio perspicillatus* [= *Carollia perspicillata*]. Further Seba figured on the same plate two bats both indicated with fig. 3. In the text on p. 90 he noted: "Num. 3. Vespertilio, Surinamensis, pullus. Instar Glirium & Murium suos pariunt foetus Vespertiliones. Nostratium, utpote satis cognitorum, nullas exhibemus figuras". Seba's French translation runs as follows: "No. 3. Le petit d'une Chauve-souris de Surinam. Les Chauve-souris font leurs petits à la maniere des Loirs & des Rats. Celles de notre païs sont trop connuës pour en donner la figure". In my opinion the left figure 3 is not at all a bat of the Neotropical region, but the juvenile of "Glis, volans, Ternatanus" (Loir qui vole, de l'Isle Ternate), of which the adult has been figured by Seba on his plate lvi fig. 1, on which figure Linnaeus (1758, p. 32) later based his description of *Vespertilio Spasma* [= *Megaderma spasma*]. The right fig. 3 of plate lv is of such a schematical character that a correct identification seems to me impossible; if the specimen really originated from Suriname, then it is apparently a vespertilionid bat (on the figure the tail is produced to the posterior border of the wide interfemoral membrane, the ears are separated, with no nose leaf is indicated). Finally Seba gave on pp. 92-93 an extensive description of "Canis volans, maxima, aurita; foemina, ex Novâ Hispaniâ" (Chienne qui vole, de la Nouvelle Espagne, très-grande, & portant de longues oreilles), which he figured on plate lviii fig. 1 (cf. pl. I in the present paper). Linnaeus (1758, p. 31)

referred to this figure under *Vespertilio Spectrum* [= *Vampyrum spectrum*].

In his 1765 paper Fermin gave an alphabetical enumeration of all plants and animals known to him from Suriname. The first part (pp. 1-56) of this book deals with the mammals and the reptiles. Under the heading "Chauve-souris" on pages 8-9 he gave a short description of species of bats which evidently are *Vampyrum spectrum* — according to him the vampire bat — and *Noctilio leporinus*. The same species were described by Fermin in his 1769 work (vol. 2, p. 139); in the 1770 Dutch version these descriptions are found in vol. 2, pp. 120-121.

In the periodical "Berlinische Sammlungen" a serious study on the Suriname blood-sucking bats was published by an anonymous author (Anonymus, 1768). The introduction of this paper is very interesting, because the author remarked that the vampire bat is by far the most common species in Suriname. Unfortunately, practically no description was given of the species, the only remark of any importance being (p. 56): "die Fledermäusse sind nicht grösser, als die europäischen". It is thus evident that the author identified the vampire bat with a small species, and not with the large *Vampyrum spectrum* as had been done by most previous zoologists. Therefore I cannot agree with Erxleben (1777, p. 134), who considered "Surinamische Fledermäuse *Berl. Samml. I* p. 53" to belong to *Vampyrum spectrum*.

Bancroft (1769, pp. 146-147) who, according to the "Advertisement" (page iii), made his observations on the natural history of Guiana within the limits of the Dutch territories, noted: "The bats of *Guiana* are the same with those near the river of the *Amazone*, being twice as large as those in *England*, and having no tail. The head and body are covered with a soft fine downy hair, of a brown colour. They are very expert at bleeding. They likewise suck the blood of Horses, Mules, Oxen, &c.". This short description of the Guiana bats points to *Vampyrum spectrum*. Zimmermann's (1780, vol. 2, p. 419) description of "der grosse Blutsauger von Südamerika" is based on Bancroft's above description; no scientific name was given by Zimmermann. On page 102 Bancroft dealt with the "Batts-Bane" as a repellent for bats (see p. 24 of the present paper). In the 1782 Dutch version of Bancroft's book these data are found on pp. 115-116, and 80-81, respectively.

In his very important publication on the history of Suriname, Hartsinck (1770, vol. 1, pp. 89-98) gave a survey of the mammals occurring in this country, indicating them with the Dutch and the vernacular names. On page 98 he mentioned the blood-sucking bat, which according to the morphological description is identical with *Vampyrum spectrum*. Furthermore Hartsinck reported a second species, which was said to be half the size of the

former, with a rounded head and with the face of a hare; this species undoubtedly is *Noctilio leporinus.*

In his well-known "Narrative, of a five years' expedition, against the revolted Negroes of Surinam" Stedman gives quite a good account of the animal life of Suriname and some of the mammals are extensively dealt with. On several places (1796, vol. 2, pp. 142-144, 170, and 205) a vivid account of the vampire bat and its blood-sucking habits is given, but no other species of Chiroptera are mentioned. Stedman himself also never observed the vampire bat in action; his inaccurate description and figures (pl. 57 opposite p. 142) probably point to *Vampyrum spectrum* or to *Phyllostomus hastatus,* In volume 3 (1800) of the Dutch translation of Stedman's Narrative data on the vampire bat are found on pages 76-80, 117, and 170-171.

Von Sack (1810, p. 153, footnote) also described *Vampyrum spectrum,* and mentioned its vampire-like habits. On pages 254 and 255 he reported upon two other species of bats, the descriptions of which are insufficient to permit of a certain identification. Von Sack's diagnosis of the second species runs as follows: "The next in size is of a dark colour, almost black; the body is of the size of a half grown rat, and the shape resembles much the same animal; the wings measure, when extended from point to point at least ten inches". In my opinion this species may be *Phyllostomus hastatus hastatus* (Pallas), or *Artibeus lituratus fallax* (Peters). The third species was described by Von Sack as follows: "There is a small kind of bat that flies as soon as it begins to grow dark, and pursues with great swiftness the flying insects". It is evident that no identification is possible here. Furthermore Von Sack remarked: "But there are fortunately at Surinam none of those very large sized bats which are found in many other parts of South America, and which, it is said, destroy a great number of cattle". It seems, therefore, that Von Sack thought that besides *Vampyrum spectrum* a still larger blood-sucking bat occurs in South America. This is not surprising because many mammalogists at that time were of the same opinion, e.g., Zimmermann (1780, vol. 2, pp. 62-63; 419). In the 1821 Dutch version of Von Sack's Narrative, based on the German edition, these data are found in vol. 1, pp. 206-207, and in vol. 2, pp. 212-213. For the method used by Von Sack to expel bats I refer to page 23 of the present paper.

Teenstra (1835, vol. 2, pp. 404-406) listed the mammals found in Suriname in a tabular form, arranged, as stated by himself, according to the classification adopted in Zimmermann's "Geographische Geschichte des Menschen, und der vierfüssigen Thiere" (1778-1783). In Teenstra's table, under each species a reference is given to the number under which this species is dealt with by Zimmermann. Teenstra referred to the Dutch (1786-1791) edition

of Zimmermann's work, which, in the text dealing with the Chiroptera (1791, vol. 2, pp. 489-500), shows no appreciable differences from the original German edition (1780, vol. 2, pp. 408-419). Seven Chiroptera are listed by Teenstra; of these only the Dutch names are given: no. 353 (Bloedzuiger), no. 354 (Hardneus), no. 355 (Trechterneus), no. 356 (Schoffelneus), no. 359 (Met den Hazemond), no. 365 (Dwergje), and no. 370 (Met den Hondsbek). Furthermore Teenstra remarked that several other species of bats, which he did not mention by name, occur in Suriname. A comparison of Teenstra's list with the data given by Zimmermann shows the former to be quite inaccurate. It evidently was Teenstra's intention to cite in his table all the species that were reported by Zimmermann from the Americas, including the species of doubtful occurrence, mentioning in his list: (a) no. 353, "der Blutsauger" [= *Pteropus vampyrus* (L.)], an Asiatic species of which Zimmermann (1780, vol. 2, pp. 62-66) mentioned the doubtful occurrence in South America, see page 125; (b) no. 355, "die Trichternase" [= *Vampyrum spectrum* (L.)], "bewohnt Mexico und das warme Südamerika"; (c) no. 356, "die Schaufelnase" [= *Carollia perspicillata* (L.)], "bewohnt Südamerika"; (d) no. 359, "die Fledermaus mit der Hasenscharte" [= *Noctilio leporinus* (L.)], "bewohnt die Mosquitoküste und Peru"; and (e) no. 370 "die hundsmäulige Fledermaus" [= *Molossus molossus* (Pallas)], "kam aus Amerika". However, no. 354 "die Herznase" [= *Megaderma spasma* (L.)], according to Zimmermann (1780, vol. 2, p. 408) "bewohnt Zeilan und die Molucken", and no. 365 "die Zwergfledermaus" [= *Pipistrellus pipistrellus* (Schreber)], "ist bis jetzt nicht nur in Frankreich und Deutschland, sondern auch im Casanischen gefunden", so that there is no good reason for Teenstra to include these in his Suriname list. Apart from citing these non-American species, Teenstra made the further error of omitting three species which Zimmermann did mention from the South American region: (a) no. 357, "die Kleeblattnase [= *Phyllostomus hastatus* (Pallas)], (b) no. 358, "die Sperrnase" [= *Glossophaga soricina* (Pallas)], and (c) no. 372, "die Beutelfledermaus" [= *Saccopteryx leptura* (Schreber)] the first mentioned two species being reported by Zimmermann from South America, the last mentioned from Suriname. Far more important than Teenstra's list are his remarks on Suriname bats (1835, vol. 2, pp. 416-418), which at least partly are evidently based on original observations (see pp. 19 and 24 of the present paper).

Benoit (1839, p. 54) noted in his "Voyage à Surinam": "Il y a un grand nombre d'espèces de chauves-souris à Surinam. On en trouve dans les forêts et même dans les maisons. J'en ai vu qui étaient monstrueuses. Je ne parlerai que de celles qu'on nomme vampires, et qui ont jusqu'à dix-huit et vingt pouces d'envergure". His description and figure 67 on plate xxxii agrees

exactly with *Vampyrum spectrum*. Further he gave an anecdotal story on the vampire bat.

In Oken's Isis (1844, pt. 2, pp. 83-110) and extensive paper on the Suriname mammals was published. The name of the author was not quite clear to the editors of the journal since they added the following note on page 83: "Der folgende Aufsatz rührt von einem Mann in Surinam her, dessen Namen wir nicht lesen können. Es sieht aus, als wenn er C. A. Lamment hiesse." There can be little doubt that the correct name of the author is Adriaan François Lammens (born Vlissingen (= Flushing), the Netherlands, 1767; died The Hague, the Netherlands, 1847), a lawyer, who from 1788 to 1796 and from 1806 to 1815 occupied various government positions in the province of Zeeland, the Netherlands. In 1815 he went to Suriname to become member and later president of the Court of Civil Justice at Paramaribo. In 1835 he retired from government service and returned to the Netherlands, where he lived in The Hague till his death in 1847 (see Voorhoeve, 1960). His interest in biology is shown by the fact that he was elected a member of a committee of the Agricultural Society of Suriname instituted in 1831 and entrusted with the task of investigating the possibilities of the Cochineal culture in Suriname (see Teenstra, 1835, vol. 2, pp. 307; 326). In some letters of H. H. Dieperink to C. J. Temminck, the director of the Leiden Museum, Lammens was mentioned as possessing a collection of natural curiosities. This is confirmed by a remark in the account of the visit of Prince Willem Frederik Hendrik to Suriname in June 1835: "Voorts bezichtigde Z. K. H. de door den heer Dieperink en den president van het gerechtshof Mr. A. F. Lammens verzamelde naturalia". (Further His Royal Highness inspected the natural history objects brought together by Mr. Dieperink and the president of the court of justice Mr. A. F. Lammens) (see Samson, 1936, p. 275). Like Teenstra's just mentioned table, the annotated list of Suriname mammals given by Lammens is, as stated by himself, arranged according to the classification adopted in Zimmermann's well known book (see also under Teenstra), of which Lammens used the Dutch version. Each species is indicated with the number under which it is dealt with by Zimmermann. Op pp. 107-110 Lammens dealt with the Suriname bats, which he divided into two sections: (a) bats with a nose leaf, and (b) bats without a nose leaf. Under the first section he enumerated all the species mentioned by Zimmermann, including one not known from Suriname: Nr. 354, "die Herznase" [= *Megaderma spasma* (L.)], which as Lammens noted on page 108 "gehört nicht nach America". Lammens tried to identify his specimens with the species described in Zimmermann's work, but was not always successful, as results from the descriptions and remarks which he gave of each species. His *Vespertilio vampyrus*

Linne, Nr. 353, evidently is *Vampyrum spectrum* (L.); Nr. 355, *Vespertilio spectrum* Linne, probably is *Artibeus lituratus fallax* Peters; both Nr. 356 (erroneously given as 856), *Vespertilio perspicillatus* Linne, and Nr. 357, *Vespertilio hastatus* Erxl., probably are based on material of *Phyllostomus hastatus* (Pallas). Lammens's Nr. 358 (*Vespertilio soricinus* Erxl.), Nr. 359 (*Vespertilio leporinus* Linne), and Nr. 372 (*Vespertilio lepturus* Erxl.), are correctly identified, his material doubtlessly belonging to *Glossophaga soricina* (Pallas), *Noctilio leporinus* (L.), and *Saccopteryx leptura* (Schreber), respectively. The Nr. 365, *Vespertilio pipistrellus* Linne, evidently is not that European species but more probably *Myotis albescens* (E. Geoffroy). The Nr. 370, *Vespertilio molossus* Erxl., judging by Lammens's description cannot be *Molossus molossus* (Pallas) but is evidently based on a specimen of *Eumops auripendulus auripendulus* (Shaw). The Nr. 374, *Vespertilio noveboracensis*, does not occur in Suriname either but as Lammens gives no details of the material that he brings to this species, it is impossible to determine the identity of his material. Furthermore Lammens described four species (p. 108 and pp. 109-110) which he considered to be new, but to which he did not give definite scientific names. The first (on p. 108) was doubtfully identified by Lammens with *Phyllostoma lineatum* E. Geoffroy, but to all appearances it belongs to *Vampyrops helleri* Peters. The other three species (on pp. 109-110) might be *Lasiurus borealis frantzii* (Peters) (Nr. 1), *Myotis nigricans* (Wied) (Nr. 2), and (Nr. 3) possibly *Rhynchonycteris naso* (Wied), though the round ears and the name "crapaudin" might suggest that it was a molossid bat.

Copijn (1858, p. 13) gave a popular account of his voyage to the interior of Suriname, and mentioned the occurrence of "large or vampire bats", without giving a description of them.

Many original observations on Suriname bats have been published by the well-known naturalist Kappler (1854, vol. 1, pp. 120, 123-124, 143; vol. 2, pp. 64, 67, 86-87; 1881, pp. 157-160, 163-164, 268-269; 1885, pp. 558-559; 1887, pp. 57-60). The observations of general interest made by him are discussed in the present paper on pages 19 to 24; for those concerning the blood-sucking bat I refer to the text under *Desmodus rotundus*. Though Kappler gave a short description of most of the mammals observed by him, such descriptions were not provided for any species of bats. He evidently did collect large series of Chiroptera as in his 1881 book (pp. 163-164) a list of the species collected by him is given. Most likely Kappler himself could not recognize the various species and sent his material for identification to the Stuttgart Museum (see Fraas, 1888). It is probable that W. Peters of the Berlin Museum undertook the identification of that material, which now is

preserved in the Berlin and Stuttgart Museums. Most of Kappler's specimens have been examined by me and are discussed in the present paper.

In the decades following the publication of Kappler's books hardly anything is found on Chiroptera in the general literature dealing with Suriname; most books being mainly concerned with the history, the people, and the geography of the country. Even in the "Encyclopaedie van Nederlandsch West-Indië" edited by H. D. Benjamins & J. F. Snelleman (1914-1917) little is found concerning Suriname bats. Under the heading "Chiroptera", Vosmaer (1914, p. 204) gives a general description of the morphology of the bats, and remarks that according to Martin the species *Glossophaga soricina* occurs in the Dutch West Indian colonies and that Kappler deals with *Molossus rufus*. It appears, however, that Martin (1887, p. 119; 1888, p. 119) only mentioned the occurrence of the former species on the island of Curaçao. De Lange (1914, p. 293), in the same Encyclopedia, under the heading "Fauna", mentions the presence of blood-sucking bats in Suriname, without noting names of species.

The zoologist Sanderson (1939, pp. 131-286) published an important popular account of the Suriname fauna in his book "Caribbean Treasure" based on his 1938 trip to Suriname. This publication contains many original observations concerning the biology and habitats of mammals, including remarks on the following bats: *Carollia* (p. 146), *Desmodus* (p. 204), *Molossus* (pp. 221-222), *Saccopteryx* (pp. 263-264), and *Rhynchonycteris naso* (pp. 265-266).

After the beginning of the nineteenth century several papers have been published by professional taxonomists in which Suriname bats were, often incidentally, dealt with. These papers generally are studies of museum collections and will be discussed more elaborately under the pertinent species.

As mentioned on page 4, in very recent years the Suriname bats have received some attention in medical, agricultural and cultural publications. This results from the fact that bats were suspected to transmit a type of rabies which had become epidemic among horses and cows. Furthermore investigations are made to find out how far Suriname bats play a rôle in the transmission of a livestock disease (the so-called murrina), of the African sleeping-sickness, and of the yellow fever.

B. Remarks on Suriname bat life

After having discussed the taxonomic questions concerning the bats found in the more or less non-scientific pre- and post-Linnean literature, it seems of interest to sum up the data concerning other peculiarities mentioned by older authors, viz., the habitats of bats, their usefulness, their enemies, and their

control. These data do not give a true picture of the Suriname bat life, because they are based on accidental observations. Therefore investigations based on modern principles and modern methods will not only be useful but absolutely necessary in order to obtain a correct idea of the biology of these animals and of the good and the harm that they may do.

1. Habitats of bats

On the labels of the specimens discussed in the present paper the collectors in most cases did not give any information on the habitats in which their animals were collected.

Also in the literature hardly anything is found about the habitats of bats occurring in Suriname, though a few interesting observations were made by the old zoologists. So Von Sack (1810, p. 153) noted: "When I first took the house here [Paramaribo] and slept upstairs, I heard at night the bats which were nestled in my roof".

Teenstra (1835, vol. 2, p. 416) remarked that in the colony of Suriname bats were found in great diversity, and by their presence in large numbers in attics and dark corners of houses often caused an almost unbearable stench. They were found especially in places which are only infrequently visited by man like the attics of outhouses, sheds, privies, etc.; here, according to Teenstra, the woodwork soon will start rotting because of the bat-faeces.

Benoit (1839, p. 54) stated: "Il y a un grand nombre d'espèces de chauves-souris à Surinam. On en trouve dans les forêts et même dans les maisons".

In his annotated list of Suriname mammals, Lammens (1844, pp. 108-109) gave some observations concerning the habitats of only two species of bats. With respect to "die Schaufelnase, *Vespertilio perspicillatus* Linne", which is apparently *Phyllostomus hastatus* (Pallas), Lammens noted: "Sie pflegen sich des Abends zahlreich bey den Häusern zu versammeln, wenn Bäume in ihrer Nachbarschaft sind, und sie verbreiten einen sehr unangenehmen Geruch, welcher die Luft verpestet", and to "die Fledermaus mit der Hasenscharte", *Noctilio leporinus* (L.): "Sie bewohnt Bäume und stinkt sehr übel".

According to Copijn (1858, p. 13) large bats or vampires, which flew at night in the moonlight over the trees, often kept him awake.

In his report on the 1861 Dutch-French border expedition, Kappler (1862, p. 176) gave some notes on the fauna of the Marowijne region, remarking of the bats: "Die Felsenspalten dienen ebenfalls eine Menge von Fledermäusen zum Zufluchtsort, die dicht gedrängt an einander sitzen, ungeachtet der Hitze, welche die erwärmten Felsplatten von sich geben. Auch sie werden in der Regenzeit durch das Wasser vertrieben und müssen dann ihre alten

Schlupfwinkel in Bäumen oder unter Heliconien-Blättern wieder aufsuchen". In a later publication, Kappler (1881, p. 158) noted: "Es gibt kein Wohnhaus, keine Hütte in Paramaribo und den Pflanzungen, die nicht einige Fledermäuse beherbergte; in meinem Wohnhaus auf Albina hatten sich stets einige Hunderte im Dache einquartirt, die ich dann, wenn der Schmutz zu sehr überhand nahm, vermittelst einer Handspritze mit kochendem Wasser verbrühte oder theilweise vertrieb. Doch stellten sie sich baldigst wieder ein. Die übrigen Gebäude, als Stallungen und Magazine, die nicht bewohnt wurden, hatten sie in ruhigem Besitz und ich glaube nicht zu übertreiben, wenn ich die Zahl der Fledermäuse, die in sämmtlichen 22 Gebäuden von Albina sich einquartirt hatten, auf wenigstens 2000 anschlage". Further Kappler (1885, p. 558; 1887, p. 58) remarked: "Man findet diese unheimlichen Thiere beinahe in jedem Hause, unter Heliconien- und Bananenblättern, in Felsenlöchern und in hohlen Bäumen, ja manche sitzen sogar an Baumstämmen, wo sie der Sonne ausgesetzt sind. In den Zuckermühlen hängen in den Dachsparren Klumpen von Fledermäusen, die ihren Unrath in die offenen Zuckerfässer fallen lassen oder in den Zuckersaft der in den Kesseln kocht. Geht die Sonne unter, dann kriechen sie aus allen Ritzen und Spalten der Dächer hervor, umschwirren den Wanderer und verbreiten überall ihren unangenehmen Geruch".

Martin (1887, p. 70) observed bats flying in daylight along the banks of the Suriname River near Gansee: "Da das Wasser niedrig ist, so befindet sich augenblicklich in unmittelbarer Nähe des Ufers fast allerorts ein überhängendes Laubdach, getragen durch lebende, halbtodte und todte Bäume, deren Leiber vielfach den Weg versperren und grossen Schwärmen von Fledermäusen zum Aufenthalte dienen; erschreckt und lautlos fliegen die Thiere davon, wenn sich unser Bot nähert, um eine kurze Zeit lang im Halbdunkel des Ufers Schutz gegen die versengenden Sonnenstrahlen zu suchen, der wir im kleinen Koriale erbarmungslos ausgesetzt sind".

Van Cappelle (1903, p. 168; French version: 1905, pp. 139-140) published the following observations made on October 8, 1900, during his exploration of the Fallawatra River, a tributary of the Upper Nickerie River, northwestern Suriname: "Groote gezelschappen vleermuizen hadden de onderzijde der donkergrijze of zwarte, uit het water stekende takken tot rustplaats gekozen en telkens als wij voorbij voeren, vlogen zij plotseling op, om na eenige omzwervingen over het water naar hunne rustplaatsen terug te keeren. Moet het ons verwonderen, waarom deze schemeringsdieren juist in het felle licht boven de rivier hunne slaapplaatsen zoeken, nog meer bevreemding moest het wekken, toen ik er eenige in de volle zon aan een tak zag hangen. Kiezen zij wellicht deze plaatsen uit, omdat zij er minder dan in het bosch

aan het gevaar bloot gesteld zijn, aan vijanden ten prooi te worden, en hebben wij hier dus weder met een voorbeeld van dierlijke vermomming te doen, zoo talrijk in de Surinaamsche binnenlanden? Zeker is het, dat het zwarte lichaam met het zwarte, doode hout, waarvan de bast veelal is weggerot, één geheel schijnt te vormen en zelfs op korten afstand niet te onderscheiden is". (The lower parts of the dark grey or black branches sticking out of the water had been chosen as resting-places by large groups of bats, and each time that our boats passed them, the bats fled to return to these resting-places after having flown for some time over the water. Though it is surprising that these crepuscular animals find their sleeping-quarters in the bright light above the river, I was still more astonished to see some of them hanging from a branch in the full sunlight. Do they choose these places because they have less to fear from enemies here than in the woods, and is this again an example of animal mimicry as one finds so often in the interior of Suriname? It is certain that the black body of the bat merges perfectly with the black dead wood of which the bark usually is rotted away, so that even from a short distance the animals cannot be distinguished).

In his report on the Gonini Expedition Franssen Herderschee (1905, pp. 62-63) mentioned the occurrence of many bats on dead branches or in rock-cavities of the Gonini River, a left tributary of the Marowijne River.

Penard & Penard (1908, p. 400) noted that the Little Long-nosed River-bats, *Rhynchonycteris naso* (Wied), often can be observed hanging from the branches of trees along the river-banks.

Fernandes (1927, p. 245), in his report on a trip along the Corantijn and Lucie Rivers in 1926, made the same observations concerning bats that choose their resting-places in dead branches over the rivers: "Op de omgevallen doode boomstammen kwamen steeds vleermuizen voor, die reeds op eenige meters afstands opvlogen en zich niet lieten vangen". (Bats were observed all the time on the fallen trunks of dead trees; it proved to be impossible to catch them since they flew off when we were still several metres away).

Also Ahlbrink (1929, p. 48), during a trip along the Corantijn River near Wonotopo, observed swarms of bats which were chased off from under overhanging trees and rocks, and noted further: ".....", en zoo ziet ge deze nachtdieren, die ik 's nachts nog geen enkelen keer gezien heb, overdag om de vijf minuten". (....., and thus one sees these nocturnal animals in the daytime about every five minutes, while I have not observed a single one at night).

The above observations on the occurrence and behaviour of bats along the Suriname creeks and rivers have been fully confirmed by Sanderson

(1939, pp. 263-266), who during his 1938 trip collected some of these bats south of the junction of the Wayombo Creek and the Coppename River. It appears that at least three species belonging to the genus *Saccopteryx* and one other Emballonurine bat, *Rhynchonycteris naso,* frequent this river-bank habitat: "... these ..... entirely diurnal bats that hung in clusters on the Cecropia trunks and flew about over the river in the blazing sunlight chasing small flies. Sometimes the trunks were lined to a height of ten feet from the water with even rows of these resting bats, equally spaced out one above the other".

All these citations, which form only an anthology from the many popular accounts on Suriname, show clearly that the great numbers of bats flying along the banks of the rivers form a striking feature in the landscape, which makes a great impression on the travellers in that part of the country.

The only observation on cave-inhabiting bats in Suriname was published by Geijskes (1959, p. 45), who during the 1958 Tafelberg Expedition in the interior of Suriname observed on 1 April a number of bats fluttering squeaking about in the cave, named by him the "Anton van Aerde grot" (see p. 44, footn.). These specimens proved to belong to *Chilonycteris rubiginosa rubiginosa* Wagner and to *Anoura geoffroyi geoffroyi* Gray.

2. Usefulness of bats

As far as known to me Kappler (1881, p. 158; see also 1885, p. 558, and 1887, p. 58) is the only author who makes mention of the usefulness of Suriname bats through their activities as insect destroyers: "Alle [die Fledermäuse] kehrten gesättigt wieder in ihre Behausung zurück, denn sie vertilgen täglich Millionen von Fliegen, Schnaken und anderen Insekten, die sonst das Land unbewohnbar machen würden. Sie sind deshalb von grösstem Nutzen und der Schaden, den sie durch Auffressen einiger Früchte und durchs Blutsaugen verursachen, kommt dagegen kaum in Betracht".

3. Enemies of bats

In the literature on Suriname bats I have only found two works dealing with the enemies of these animals. Kappler (1881, p. 160; see also 1885, p. 559, and 1887, p. 60) noted: "Fledermäuse scheinen wenig Feinde zu haben ausser einer kleinen Boa kenne ich nur einen kleinen Falken, der ihnen auflauert und sich von ihnen nährt. Er fliegt nur bei Sonnenuntergang, und sein Flug gleicht genau dem einer grossen Fledermaus, wenn er die kleineren im Fluge fängt". In his 1885 and 1887 papers Kappler gave

as the scientific name for "den kleinen Falken": *Falco albigularis* [= *Falco rufigularis rufigularis* Daudin] [1]).

Penard & Penard (1908, pp. 398, 428, 429, 432, and 435) stated in the first volume of their well-known book on the birds of the Guianas that the native names of certain species of Suriname birds of prey indicate that these species feed on bats, these names being Vleimoesoe-akka (Bat-falcon), Boekoerie- or Lelia-balielie (Master of the bats). These authors, however, pointed to the fact that such native names might in some cases be misleading, since they themselves knew of only two species which actually prey on bats: *Rupocornis magnirostris* Gm. [= *Buteo magnirostris magnirostris* (Gmelin)], which according to them seems to prefer the bat *Rhynchonycteris naso* (Wied), and *Falco albigularis* d'Aub. [= *Falco rufigularis rufigularis* Daudin], which preys especially on bats hanging in rows on the branches of trees. These observations of the Penard brothers are confirmed by those of Kappler on *Falco albigularis* (see above), and by Chubb (1916, p. 241), who stated that *Buteo magnirostris* especially feed on *Rhynchonycteris naso* "which they pick off the bark of the trees along the creeks and rivers". Furthermore Penard & Penard mentioned that they never did observe *Campsonyx swainsoni* Vig. [= *Gampsonyx swainsonii leonae* Chubb] and *Harpagus bidentalus* Lath. [= *Harpagus bidentatus bidentatus* (Latham)] to feed on bats, while they neither confirm nor deny the bat-eating habits of *Falco fusco-coerulescens* Vieill. [= *Falco fuscocaerulescens fuscocaerulescens* Vieillot], and of *Falco aurantius* Gm. [= *Falco deiroleucus* Temminck]. It seems most probable that these authors were not acquainted with the habits of the two last-named birds from their own experience; this is the more probable since Haverschmidt (1955) did not insert the two species in his list of Suriname birds, no certain Suriname records being known to him.

4. The control of bats

The first Suriname account to drive bats out of a roost was given by Von Sack (1810, p. 153; Dutch version, 1821, vol. 1, pp. 206-207): "When I first took the house here [at Paramaribo] and slept up stairs, I heard at night the bats which were nestled in my roof, and as these are very unpleasant visitors in this country, I tried an experiment for their expulsion, the success of which exceeded my expectations. Just at noon when the sun shone most, I chased them from the roof with a long reed cane, and this frightened them so much, that they did not return again: I therefore repeated this when-

1) The scientific names of birds in square brackets are those used by Hellmayr & Conover (1949) and by Haverschmidt (1955).

ever I heard any fresh intruder; but this has not happened above twice or three times since I have lived here".

According to Teenstra (1835, vol. 2, pp. 417-418) the best method to get rid of bats and wasps in houses and other buildings is to kill them with boiling water. For this purpose he mentioned the old-fashioned squirts that are used for cleaning windows as extremely useful. The boiling water does not cause the slightest damage to the woodwork of the houses, and even kills numerous insects living in it. In places which cannot be reached by the squirts, the boiling water must be poured in with the aid of small hoses or pipes, or through openings that are to be made specially for this purpose. Bats which cannot be removed do not rot for within one day they are eaten by ants. Kappler (1881, p. 158) also mentioned the use of squirts for the control of bats (see the citation in the section: The habitats of bats). Furthermore Teenstra stressed the fact that a regular painting of the woodwork of houses will prevent bats and other vermin from entering and nesting there.

On several places in his publications Kappler (1854, vol. 1, p. 120; vol. 2, p. 67; 1881, pp. 158-159; 1885, p. 558; 1887, p. 58) mentioned that the best method to scare away blood-sucking bats is the use of light. During his stay near Armina he found that the large numbers of vampires made it necessary to keep the barracks lighted throughout the night (Kappler, 1854, vol. 2, p. 67).

Other methods for repelling bats were discussed by Kappler as follows: "Wird Vieh gebissen, so soll ein recht stinkender Bock in demselben Stalle die Fledermäuse vertreiben. Auch eine Liane, die stark nach Knoblauch riecht, soll ihnen zuwider sein". (1887, p. 60; see also Kappler, 1854, vol. 1, p. 124; 1881, p. 160, and 1885, p. 559). To which in 1881 (on page 160) he added: ".....", doch habe ich beide Mittel ohne Erfolg angewendet". In his 1854 publication (vol. 1, p. 123) Kappler remarked that at Nepheusburg, where blood-sucking bats were very harmful to his chickens, he was unsuccessful in his efforts to drive them away with the use of "Aniswiwiri, bladen eener naar anijs ruikende struik, ofschoon de vledermuizen den reuk er van niet kunnen verdragen". (Aniswiwiri, leaves of a shrub which have a strong anise-like smell, to which the bats seem to have an aversion). In this connection it is worth while to note that Bancroft (1769, p. 102) remarked that: "Batts-Bane is the fruit of a woody vine, growing by the edges of water, and supporting itself by the neighbouring trees. It bears a large triangular leaf, and near its top arise several long foot-stalks, supporting clusters of blueish white pentapetalous flowers, which are succeeded by clusters of globular somewhat angled fruit, inclosed in a smooth green

husky tegument. They are about nine lines in diameter, and are used by the Indians only to poison Batts, (which are here very troublesome), for which purpose they are very effectual".

Dr. C. F. A. Bruijning, who from 1949 to 1955 was biologist of the Bureau of Preventive Medicine in Suriname, was so kind to inform me that the vine with the garlic smell [= *Pseudocalymma alliaceum* (Lamarck) Sandwith] mentioned by Kappler (1887, p. 60) is still used as a repellent, but the results are rather poor. Its vernacular names are "tingiteté", and "ajoenteté", while the Dutch name is "knoflookliaan". Furthermore he informed me that he was not acquainted with the use by the Indians and the Bushnegroes of the shrub with the anise-like smell [= *Potomorphe peltata* (Linnaeus) Miquel] against bats. Unfortunately I have not been successful in my efforts to find out the identity of the woody vine described by Bancroft (1769, p. 102).

Dr. Bruijning also informed me that the spraying squads of the Suriname Mosquito Control Service sprayed attics of houses where incidentally large numbers of bats were found. The effect of this spraying on the bats depended either on the insecticide or on the dissolving liquid. DDT dissolved in kerosine kills the bats which are caught in the spray but did not have lasting residual effects. A dispersion of crude BHC (benzenehexachloride) acted as a repellent, while a dieldrin residue kills the bats soon after spraying.

Dr. D. C. Geijskes, Director of the Surinaams Museum at Paramaribo, kindly informed me that in November 1956 he had good results with "Malathion", a phosphor-poison used as an insecticide. The greyish powder of this insecticide smells of rotten cabbage; it drove the bats from the attic of Geijskes's house at Republiek, while a week after spraying he found some ten dead bats in the attic. Since Geijskes did not repeat this experiment in other buildings it is not fully certain whether or not "Malathion" actually can be considered a good repellent for bats.

III. SYSTEMATIC PART

The Microchiroptera, the only suborder of the Chiroptera occurring in the New World, are represented in Suriname by eight families, which can be separated with the following key.

KEY TO THE SURINAME FAMILIES OF MICROCHIROPTERA

1. Tail thick and long, extending for about half its length beyond the posterior border of the well developed interfemoral membrane (fig. 1a) . . . . Molossidae, p. 230
— Tail, if present, extending not at all beyond the posterior border of the interfemoral membrane or with less than one-third of its length 2
2. Muzzle with prominent nose leaf, the vertical, free portion lancet-shaped (fig. 15) Phyllostomidae (except Chilonycterinae), p. 73

— Muzzle without prominent true nose leaf, appendices of nose never lancet-shaped (fig. 33) 3
3. Tail partly enclosed in the interfemoral membrane; the free part of the tail emerging proximally from the centre of the dorsal surface of the membrane (fig. 1f) . . 4
— Tail, if present, entirely enclosed in the interfemoral membrane (fig. 1d) or leaving the membrane at its posterior margin (fig. 21g) 6
4. Third digit with two phalanges only 5
— Third digit with three phalanges; chin with flat dermal plates provided with numerous, small rounded papillae (fig. 13a) . Phyllostomidae (subfamily Chilonycterinae), p. 74
5. Upper lip deeply grooved, resembling that of a hare; muzzle truncated (fig. 8a); wings attached to the back of the body . . . . . Noctilionidae, p. 62
— Upper lip not deeply grooved (fig. 3); wings attached to the sides of the body . . . . . Emballonuridae, p. 26
6. Third digit with two phalanges only; thumb greatly reduced, included in the wing membrane, and placed at the base of the minute claw (fig. 31); tail ending in the distal part of the interfemoral membrane (fig. 1d) . . . . Furipteridae, p. 200
— Third digit with three phalanges; thumb not greatly reduced; tail absent (fig. 28) or extending to or slightly beyond the posterior border of the wide interfemoral membrane (fig. 1b) 7
7. A prominent circular sucking disk is present at the base of the thumb; a similar disk at the base of the sole of the hind foot (fig. 32) . . . . . Thyropteridae, p. 203
— No circular sucking disk at either hand or foot 8
8. No external tail; interfemoral membrane narrow and short, if stretched extending from about the middle of one tibia to the other (fig. 1g) . . . Desmodidae, p. 187
— Tail present, reaching to or slightly beyond the posterior border of the wide interfemoral membrane; the membrane if stretched extending beyond the hind feet (fig. 1b) . . . . Vespertilionidae, p. 208

Family EMBALLONURIDAE

The main external characters of the Suriname Emballonuridae are as follows: (1) the third digit has two phalanges only, of which the second is much longer than the first; (2) the slender tail is of about half the length of the wide interfemoral membrane, perforating this membrane at about its centre and appearing on its dorsal surface; (3) the calcar is relatively long, having more than half the length of the tibia, and (4) in most species a so-called wing sac is present in the antebrachial membrane, the position and the shape of this wing sac, well developed in males, rudimentary or absent in females, are characters to distinguish closely related genera (see Sanborn, 1937, p. 323 fig. 37).

All genera have the same dental formula: $\frac{1.1.2.3}{3.1.2.3}$. The upper incisors are separated by a wide space from each other; this space is caused by the fact that the premaxillaries are not fused with either each other or with the maxillaries; the anterior border of the palate is emarginate. The first upper premolar is minute, in some genera it is reduced to a structureless spicule.

Of the family Emballonuridae two subfamilies occur in Suriname: the Emballonurinae and the Diclidurinae. The single species of the Diclidurinae

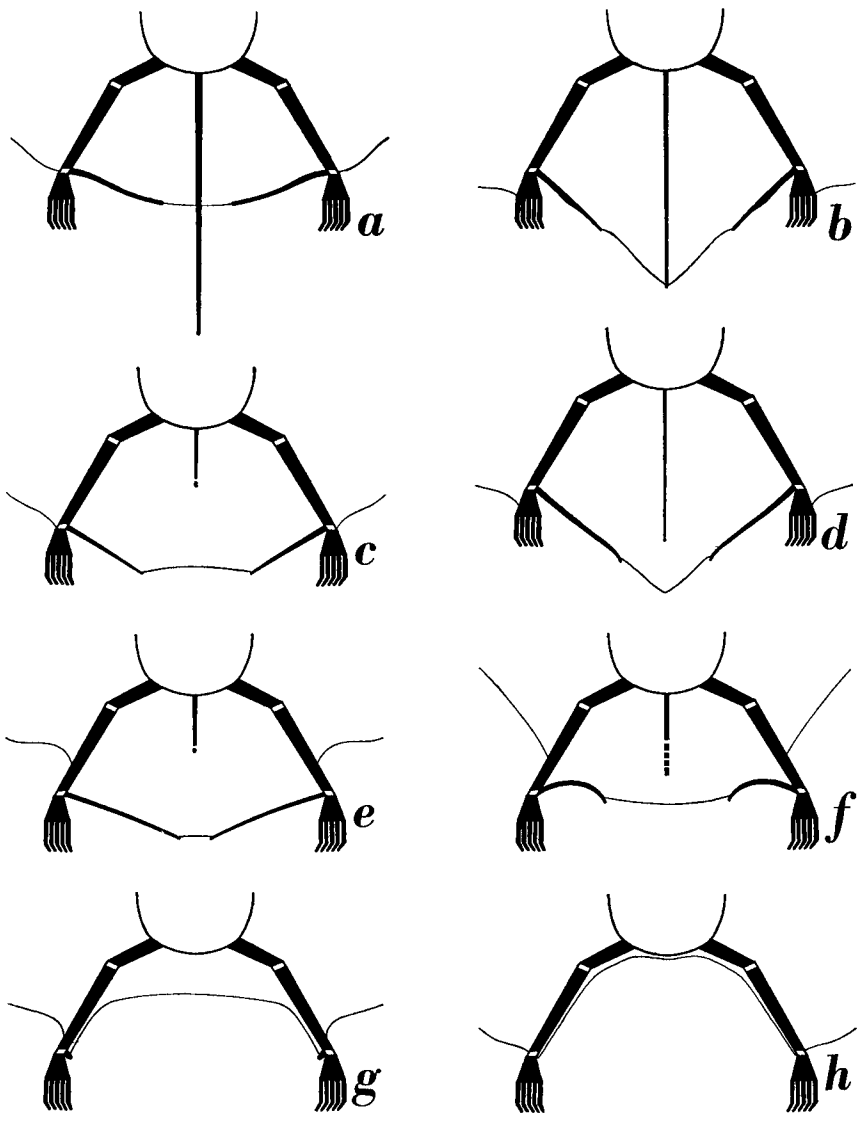

Fig. 1. Diagrams of interfemoral membranes, ventral view, showing the various forms to be observed in Suriname bats. a, Molossidae: *Eumops geijskesi* nov. spec.; b, Vespertilionidae: *Lasiurus borealis frantzii* (Peters); c, Emballonurinae: *Peropteryx kappleri kappleri* Peters; d, Furipteridae: *Furipterus horrens* (F. Cuvier); e, Noctilionidae: *Noctilio leporinus leporinus* (L.); f, Chilonycterinae: *Chilonycteris rubiginosa rubiginosa* Wagner; g, Desmodidae: *Desmodus rotundus rotundus* (E. Geoffroy); h, Sturnirinae: *Sturnira lilium lilium* (E. Geoffroy).

known from Suriname can immediately be distinguished from all other Suriname bats by the white colour of its fur and membranes. The Emballonurinae represented in Suriname show remarkable differences in the size, the colour, and the position of the wing sac, which even may be absent.

Subfamily EMBALLONURINAE

In the present subfamily the skull has long and curved postorbital processes (which often are broken off during cleaning). Eight species of the Emballonurinae are known with certainty from Suriname. Though not yet actually reported from Suriname, the species *Peropteryx macrotis macrotis* (Wagner) possibly also occurs there as it is widely distributed on the mainland of South and Central America from Brazil and Peru northward to Yucatan and Guatemala. For this reason the species is included in the following key.

A revision of the subfamily was given by Sanborn (1937); the range of variation of the external and skull measurements mentioned in the present paper are mainly based on Sanborn's publication.

Key to the Suriname Emballonurinae

1. Calcar much longer than the tibia, about half the length of the forearm; wing sac absent; small tufts of whitish hairs are present behind and along the dorsal surface of the forearm; dorsal surface of the body shows a light grizzled appearance, the ventral surface is whitish or greyish. Length of forearm varying from 35.5 to about 41 mm; length of upper tooth-row, c-m^3, varying from 4.3 to 4.7 mm . . . . . *Rhynchonycteris naso*, p. 29
— Calcar as long as or shorter than the tibia; no tufts of whitish hairs along the dorsal surface of the forearm; wing sac usually present 2
2. Wing membrane from the base of the outer toe or from the side of the foot above the base of the outer toe (fig. 2e) 3
— Wing membrane from the distal part of the tibia or from the ankles (fig. 2f) . 4
3. Metacarpal of the third digit equals the length of the forearm; wings from the base of the outer toes; no wing sac known. Length of forearm varying from 42.6 to 44.5 mm; length of upper tooth-row, c-m^3, about 5.8 mm. . . . . *Centronycteris maximiliani maximiliani*, p. 56
— Metacarpal of the third digit considerably shorter than the forearm; wings from the side of the foot; wing sac long, often extending from near the anterior border of the antebrachial membrane to near the elbow. Length of forearm varying from 43.3 to 49.8 mm; length of upper tooth-row, c-m^3, varying from 6.1 to 6.8 mm. . . . . *Cormura brevirostris*, p. 46
4. Ears connected by a low band across the forehead; wing membrane, at least between a line drawn from the elbow to the knee and the outer margin, white; wing sac small, about in the middle of the anterior border of the antebrachial membrane. Length of forearm varying from 41 to 47 mm; length of tooth-row, c-m^3, varying from 6 to 6.6 mm. . . . . *Peronymus leucopterus leucopterus*, p. 54
— Ears not connected by a band across the forehead; wing membrane throughout of the same dark colour 5

5. Dorsal surface of body with two more or less distinct longitudinal wavy lines of a whitish or buffy colour from shoulders to rump; wing sac close to the forearm near the elbow 6
— Dorsal lines absent; wing sac small, near the anterior border of the antebrachial membrane 8
6. Dorsal surface of body black, in specimens with worn pelage more brownish; wing membranes black; wing sac, at least in males, remarkably large. Length of forearm varying from more than 44 mm to 51.7 mm; length of upper tooth-row, c-m^3, varying from 6.7 to 7.4 mm (usually more than 7 mm) . . . *Saccopteryx bilineata,* p. 36
— Dorsal surface of body uniformly brown or greyish brown; wing sac not remarkably developed. Length of forearm less than 44 mm; length of upper tooth-row, c-m^3, varying from 4.6 to 5.5 mm 7
7. Dorsal surface of body uniformly brown, ventral surface a little lighter; longitudinal lines usually distinct. Length of forearm varying from 37.4 to 42.3 mm; length of tooth-row, c-m^3, varying frim 5.1 to 5.5 mm, width across molars from 5.9 to 6.3 mm . . . . *Saccopteryx leptura,* p. 41
— Dorsal surface of body greyish or brownish with a grizzled appearance; ventral surface much lighter, grey or buffy; longitudinal lines usually indistinct and irregular. Length of forearm varying from 35.8 to 40.8 mm; length of upper tooth-row, c-m^3, varying from 4.6 to 5.1 mm, width across molars from 5.1 to 5.6 mm . . . . . *Saccopteryx canescens,* p. 45
8. Length of forearm varying from 45 to 53.6 mm; greatest length of skull varying from 16 to 17.8 mm, length of the upper tooth-row, c-m^3, from 6.7 to 7.8 mm, width across molars from 7 to 8.3 mm . . . . . *Peropteryx kappleri kappleri,* p. 51
— Length of forearm varying from 38.3 to 48.2 mm; greatest length of skull varying from 12 to 15 mm (mean 14.1 mm), length of upper tooth-row, c-m^3, from 4.6 to 6.2 mm, width across molars from 5.5 to 6.8 mm . . . . . *Peropteryx macrotis macrotis* (Wagner)

Rhynchonycteris naso (Wied)

(figs. 2a, 3a, 5a; pl. II)

Vespertilio Naso Wied, 1820, Reise nach Brasilien, vol. 1, p. 251 footnote.
Emballonura lineata Temminck, 1841, Monographies de Mammalogie, vol. 2, pp. 297-298.
? "Neue Gattung: Nr. 3", Lammens, 1844, Isis 1844, p. 110.
Rhynchonycteris naso, Peters, 1867, Monatsber. Akad. Wiss. Berlin 1867, p. 478.
Rhynchonycteris naso, Dobson, 1878, Catalogue Chiroptera British Museum, p. 369.
Emballonura sacatilis, Kappler, 1881, Holländisch-Guiana, p. 163.
Rhynchonycteris naso, Jentink, 1887, Mus. Hist. Nat. Pays-Bas, vol. 9, p. 285; 1888, vol. 12, p. 196.
Rhynchonycteris naso, Penard & Penard, 1908, Vogels van Guyana, vol. 1, p. 400.
Rhynchonycteris naso, Sanderson, 1939, Caribbean Treasure, pp. 265-266.

Type locality. — The type locality of *Vespertilio naso* is "Die Ufer des Mucuri", Minas Geraes, Brazil, while that of *Emballonura lineata* is "Surinam".

Distribution. — The species has a wide range of distribution extending from southern Mexico through Central America to South America, where it occurs from Venezuela, Trinidad and the Guianas southward to northern Peru and central Brazil (see Sanborn, 1937, fig. 38: map of distribution;

Hall & Kelson, 1959, map 43). According to Sanborn (1937), the reviser of the genus *Rhynchonycteris,* the genus is monotypical.

Specimens examined.

Suriname; between 1824 and 1836, H. H. Dieperink; RMNH, reg. no. 17642: lectotype of *Emballonura lineata* Temminck, sex unknown, dried skin in poor condition, skull extracted (= Jentink's 1887 and 1888 *Rhynchonycteris naso,* no. a).

Suriname; 1844, A. Kappler; SMN, Nr. 264b-370, a-f: two males and four females, respectively, preserved in alcohol, skulls extracted.

Suriname; date unknown, A. Kappler; ZMB, Nr. A4203: five males and two females, preserved in alcohol, skulls extracted.

Suriname; date unknown, A. Kappler; ZMB, Nr. A1837: three males and seven females, preserved in alcohol, skulls extracted.

Suriname; date unknown, A. Kappler; ZMB, Nr. 3225: three males and four females, preserved in alcohol, skulls extracted.

Mombabasoe, Upper Saramacca River; November 1902, P. J. de Kock; RMNH, reg. nos. 17443 and 17445: two males; reg. nos. 17440-17442, 17444, 17446-17450: nine females. All specimens preserved in alcohol, skulls inside.

Gonini River, left tributary of the Marowijne River; 1904, G. Versteeg; RMNH, reg. no. 17439: male, preserved in alcohol, skull inside.

Tapanahoni River, left tributary of the Marowijne River; 1904, G. Versteeg; RMNH, reg. nos. 17420-17424: one male and four females, respectively, preserved in alcohol, skulls inside.

Tapanahoni River, left tributary of the Marowijne River; 1905, G. Versteeg; RMNH, reg. nos. 17425-17435: four males and seven females, respectively, preserved in alcohol, skulls inside.

Suriname River, south of Gansee, between Aurora and Bottopassi; July 15, 1908, J. H. A. T. Tresling; ZMA, no. 1652: one male and one female, preserved in alcohol, skulls inside.

Paramaribo; August 4, 1908, C. Heller; ZMH, Nr. 38831: female, preserved in alcohol, skull inside.

Suriname; October 27, 1909, C. Heller; ZMH, Nr. 38983, a-c: one male and two females, preserved in alcohol, skulls inside.

Upper Gran Rio, southern part of Suriname River basin; September 8, 1910, J. F. Hulk; RMNH, reg. nos. 17555-17558: one male, two females, and one sex unknown, preserved in alcohol, skulls extracted.

Paramaribo; 1911, W. C. van Heurn; RMNH, reg. nos. 17546-17548: one male and two females, respectively, preserved in alcohol, skulls extracted.

Paramaribo; March 17, 1939, H. W. C. Cossee; RMNH, reg. nos. 3917, 3919, and 3920: one female and two males, respectively, preserved in alcohol, skulls extracted.

Wane kreek, mouth of the Marowijne River; September 28, 1948, Suriname Expedition 1948/1949; RMNH, reg. nos. 17538-17540: three females, dried skins and skulls; reg. nos. 17537 and 17554: two females, skulls only.

Sipaliwini River, southernmost part of Suriname; February, 1961, D. C. Geijskes and St. Ligorie; RMNH, reg. no. 17277: one male, preserved in alcohol, skull inside.

Description. — Wied (1820, p. 251 footnote; 1826, pp. 274-279); Temminck (1841, vol. 2, pp. 297-298: *Emballonura lineata*); Dobson (1878, pp. 366-369; pl. xx fig. 4: head, left side view); Miller (1907a, pp. 88-89; fig. 13: skull); Sanborn (1937, pp. 325-328; fig. 38: map of distribution); Vieira (1942, pp. 246-249; fig. 4: animal, ventral view); Goodwin & Green-

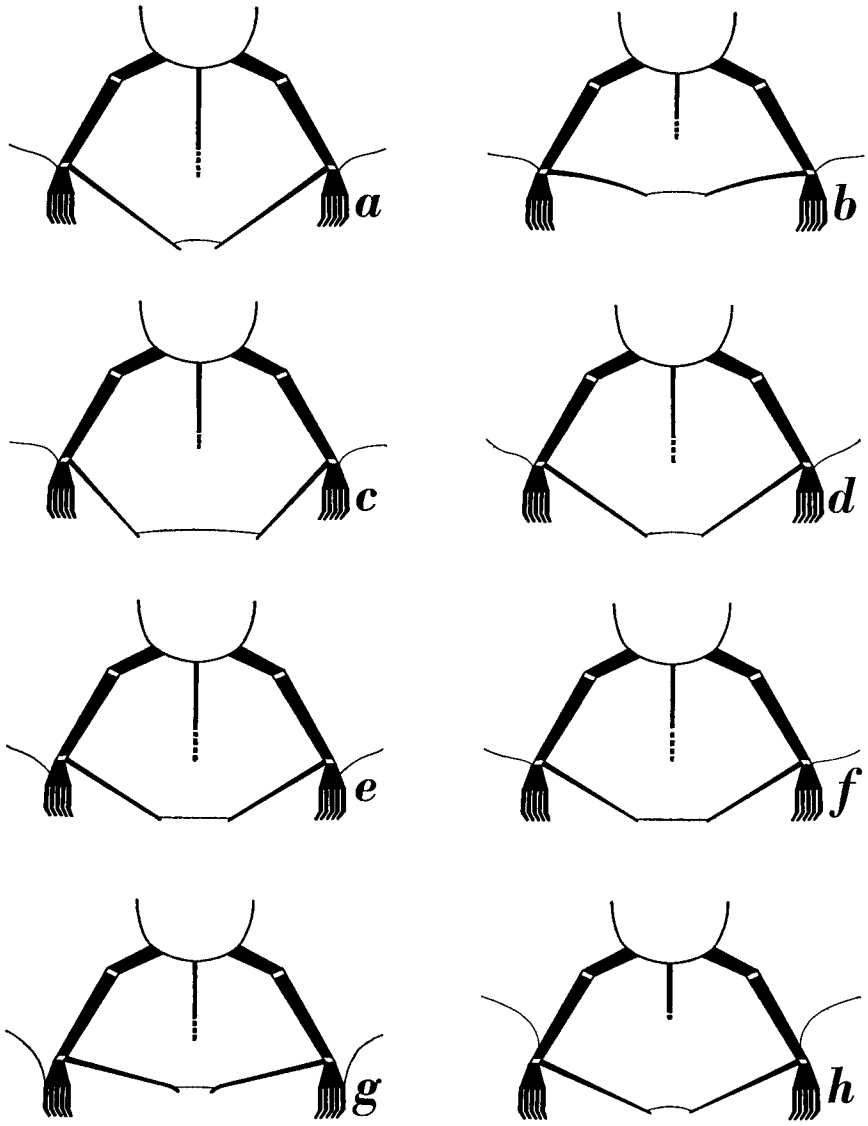

Fig. 2. Diagrams of interfemoral membranes, ventral view, showing the various forms to be observed in Emballonurinae (a-g) and Noctilionidae (h). a, *Rhynchonycteris naso* (Wied); b, *Saccopteryx bilineata* (Temminck); c, *Saccopteryx canescens* Thomas; d, *Saccopteryx leptura* (Schreber); e, *Cormura brevirostris* (Wagner); f, *Peronymus leucopterus leucopterus* (Peters); g, *Centronycteris maximiliani maximiliani* (Fischer); h, *Noctilio labialis albiventris* Desmarest.

hall (1961, pp. 211-212; fig. 2: head, left side view; fig. 3: forearm, dorsal view; pl. 7 figs. 1-3: skull).

Length of forearm varying in males from 35.3 to 40.5 mm, in females from 35.8 to 40.7 mm; the females are on an average larger than the males; ears narrow and subacutely pointed, about 12 mm long; muzzle rather long and narrow, the upper lip produced far beyond the lower lip; wing sac absent; interfemoral membrane well developed, when stretched extending slightly beyond the toes; calcar (about 18 mm) much longer than the tibia (about 14 mm), nearly equal to half the length of the forearm, and about three times as long as the free margin of the interfemoral membrane; tail not reaching to the middle of the interfemoral membrane, perforating this membrane and appearing on the dorsal surface, the free end being up to 5 mm long; wing membranes from the ankles or from the proximal part of the metatarsus. The fur is soft and dense; dorsally it extends on the wing membranes as far as a line drawn from the proximal third of the upper arm to the knee, the area between this line and that drawn from about the middle of the forearm to the ankles shows whitish hairs more or less arranged in small tufts; similar tufts, varying in size, are found along the forearm; the dorsal surface of the interfemoral membrane as well as the hind extremities are covered with rather long whitish or light greyish hairs, this pubescence extends to about the level of the ankles, the remaining part of the membrane is loosely and thinly haired. On the ventral surface the antebrachial membrane is naked, the dots of whitish hairs along the forearm are absent, but the wing membrane is clothed with soft whitish hairs as far as a line drawn from the elbow to the proximal third of the thigh; the ventral surface of the interfemoral membrane is rather regularly and thinly covered with very short whitish hairs. The hairs of the dorsal surface of the body are dark to blackish brown, the tips are whitish or greyish, giving the coat a grizzled appearance; in some specimens the lower back and the rump show two wavy lines of a whitish tinge, in old specimens with worn pelage the light tips are worn off so that the coat colour is practically dark brown. The basal half of the hairs of the ventral surface is dark brown, the distal half whitish or light greyish so that the coat colour here is quite uniformly light greyish or whitish. The membranes are dark brown above and beneath.

Dental formula: $\frac{1.1.2.3}{3.1.2.3}$. Upper incisors minute, separated by distinct spaces from each other as well as from the canines; upper premolar small, placed nearer to the canine than to the large second premolar, varying from an almost simple tooth with barely indicated anterior and posterior cusps to a rather broad triangular tooth with prominent cusps; the shaft of the second

premolar is slightly higher than the crown of the first molar. Lower incisors small, trifid, forming a continuous row between the canines; canine slender; first lower premolar with distinct anterior and posterior cusps, touching the canine, but separated by a small space from the second premolar, the latter is about as wide as the former but its shaft is about twice as long as that of the first premolar. The basisphenoid pits are deep, not divided by a longitudinal plate. The shape of the palate and the tooth-rows is very striking, the whole is about quadrate as the tooth-rows are parallel while the width across the molars equals the length of the tooth-row.

The external and skull measurements of ten specimens of the present species from Suriname, including the lectotype of *Emballonura lineata* Temminck, are given in Table I.

Remarks. — The most striking external characters by which *Rhynchonycteris naso* differs from the other Suriname Emballonurinae are: (a) the presence of small tufts of whitish hairs behind and along the dorsal surface of the forearm, and (b) the length of the calcar, which is greater than that of the tibia and nearly equal to half the length of the forearm.

Temminck's (1841, p. 298) description of *Emballonura lineata* was, as stated by himself, based on two specimens from Suriname. Already in 1887 only one of the these two "cotypes" remained in the collection of the Leiden Museum (see Jentink, 1887, p. 285; 1888, p. 196). It is unknown to me what happened to the second syntype and whether it still exists. The syntype that is still present in the Leiden Museum is now selected as the lectotype of *Emballonura lineata* Temminck. This mounted specimen is in a rather poor condition and is strongly bleached; the skull lacks the upper incisors. An examination of the lectotype shows the correctness of the opinion of previous authors that Temminck's species is identical with *Rhynchonycteris naso* (Wied). Since to my knowledge no external and skull measurements of this specimen have been published up to now, some of them are given in Table I; all measurements of the specimen fall within the range of variation of the examined specimens of the present species.

Rhynchonycteris naso is one of the most common species of bats along the Suriname creeks and rivers; it is almost certain that the observations dealt with on pages 19-22 of the present paper for the greater part refer to *Rhynchonycteris*. These data namely agree rather well with those given by Wied (1820, p. 251) in the original description of his *Vespertilio naso* and with the more recently published accounts by Dalquest (1957b).

It is possible that Lammens (1844, p. 110) intended to describe *Rhynchonycteris naso* as his "Neue Gattung: Nr. 3", it is also possible, however, that he confused the animal with a molossid bat. His diagnosis is as follows:

TABLE I

External and skull measurements of ten specimens of *Rhynchonycteris naso* (Wied) from Suriname. RMNH reg. no. 17642 is the lectotype of *Emballonura lineata* Temminck.

Museum		ZMB	RMNH	RMNH	RMNH	ZMB	ZMB	RMNH	RMNH	ZMB	RMNH
Reg. number		A4203,2	3920	3919	17556	A1837,4	3225,1	17557	3917	A4203,6	17642
Sex		♂	♂	♂	♂	♂	♀	♀	♀	♀	?
Forearm		37.1	37.6	38.2	37.8	39.0	38.2	37.8	39.5	38.5	39
Third digit,	metacarpal	37	37.5	38.5	37	40	38	38	41	40	40
	1st phalanx	11.5	12	11.5	11	12	11.5	11.5	11.5	13	12
	2nd phalanx	18	18	18	17	18	17	19	19	19	17
Fourth digit,	metacarpal	31.5	30.5	32	31	31.5	32.5	32	34	33	34
	1st phalanx	8.5	8	8	9	8.5	8.5	8.5	9	9	8.5
	2nd phalanx	5.5	7	7	6.5	6	6	6.5	7.5	6	—
Fifth digit,	metacarpal	29.5	29	30	30.5	31.0	30.5	30.5	31.5	31	31
	1st phalanx	6.5	8.5	9	9	9.5	8.5	9	9.5	9.5	8.5
	2nd phalanx	4.5	5	5	5	4.5	4	5	6	5	4.5
Tibia		13.5	14	14	13.5	14	14	14	14	14	14
Hind foot		7	7	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6
Calcar		18	18	17	18	18	17	18	19	19	—
Skull:											
greatest length from c		11.4	11.7	11.7	11.8	12.0	11.6	11.7	11.8	12.0	11.6
condylobasal length from c		10.3	10.3	10.1	10.6	10.6	10.2	10.3	10.6	10.4	10.3
basal length from c		9.4	9.3	9.2	9.6	9.5	9.2	9.4	9.5	9.5	9.5
zygomatic breadth		6.9	7.0	6.7	—	7.1	6.7	7.1	7.2	7.2	7.0
breadth of braincase		6.1	5.8	6.1	5.9	6.2	6.0	6.3	6.2	6.1	6.1
height of braincase		5.2	5.4	5.2	5.2	5.3	5.1	5.2	5.3	5.3	—
mastoid breadth		6.3	6.3	6.4	6.6	6.6	6.3	6.5	6.6	6.5	6.5
interorbital constriction		2.8	3.1	—	3.2	2.8	3.1	3.3	3.3	3.1	3.0
postorbital constriction		2.4	2.5	2.5	2.4	2.3	2.2	2.3	2.4	2.4	2.5
width across molars		4.5	4.2	4.1	3.8	4.5	4.3	4.6	4.7	4.6	4.7
width across cingula canines		3.0	3.2	—	2.6	3.0	3.1	3.2	3.2	3.3	3.2
upper tooth-row, c - m^3		4.3	4.2	4.4	4.4	4.4	4.2	4.4	4.3	4.3	4.4
lower tooth-row, c - m_3		4.4	4.3	4.5	4.5	4.4	4.2	4.4	4.3	4.3	4.4
length of mandible		8.1	8.1	7.7	8.1	—	7.5	8.0	7.7	8.0	7.7

"Länge 2¼", Flugweite 9, Schwanz 1. Die Schnauze ist ganz regelmässig und spitzig; die Nase geht weit über den Unterkiefer hinaus; die Ohren rund, behaart, in Gestalt wie die des Crapaudins, jedoch auf der Stirn nicht so nahe beysammen; der Schwanz steckt zur Hälfte in der Flughaut; der Leib ist mausfarben; Bauch und Kehle grauweiss. Buffon's Beschreibung Bd. X. S. 37 stimmt mit meinem Stück überein, obschon das mit dem Kopfe der Figur I. Tafel 19. nicht der Fall zu seyn scheint. Es frägt sich aber, ob man sich auf die Abbildung verlassen kann".

No uniformity exists in the use of the generic name for this genus. Some authors consider *Rhynchonycteris* Peters (1867, p. 477) to be a junior homo-

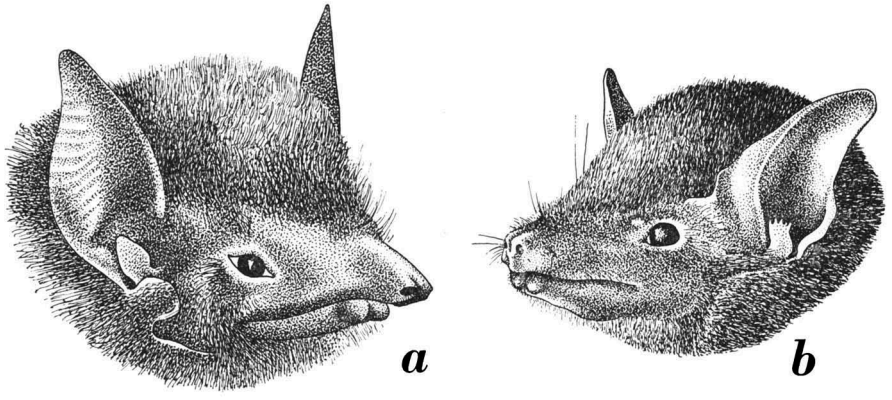

Fig. 3. a, *Rhynchonycteris naso* (Wied), RMNH, reg. no. 17277; b, *Saccopteryx bilineata* (Temminck), RMNH, reg. no. 17387.

nym of *Rhinchonycteris* Tschudi (1844, p. 71). However, *Rhinchonycteris* Tschudi cannot invalidate *Rhynchonycteris* Peters because the original spelling of these two names differs in one letter (i and y), which according to Article 56a of the 1961 Code (page 53) is sufficient for these names not to be considered homonyms. The generic name *Rhynchiscus* Miller (1907b) consequently must be considered an invalid junior objective synonym of *Rhynchonycteris* Peters, 1867. The fact that at the time Miller (1907b) substituted the name *Rhynchiscus* for *Rhynchonycteris* his action according to the then existing Rules was valid, is of no importance as in the 1961 Code (Article 84; page 89) it is emphatically stated that it supersedes all previous editions of the International Rules. The arguments of Goodwin & Greenhall (1961, p. 211) for retaining *Rhynchiscus* therefore do not hold good. As *Rhynchonycteris* is the more commonly used of the two names (it can be found in the fundamental works of Simpson (1945, p. 55), Cabrera (1958,

p. 48), and Hall & Kelson (1959, p. 80)) there seems to be no good reason to have this name suppressed under the plenary powers of the Commission in order to save the name *Rhynchiscus*.

Saccopteryx bilineata (Temminck)

(figs. 2b, 3b, 4, 5b; pl. II)

Urocryptus bilineatus Temminck, 1838, Tijdschr. Nat. Gesch. en Physiol., vol. 5, pp. 33-34, pl. ii.

Urocryptus bilineata, Kappler, 1881, Holländisch-Guiana, p. 163.

Saccopteryx leptura, Jentink, 1887, Mus. Hist. Nat. Pays-Bas, vol. 9, p. 286 (non *S. leptura* (Schreber)).

Saccopteryx bilineata, Jentink, 1888, Mus. Hist. Nat. Pays-Bas, vol. 12, p. 197.

Saccopteryx, Sanderson, 1939, Caribbean Treasure, p. 263.

Type locality. — "Suriname".

Distribution. — According to Sanborn (1937, p. 330; fig. 39: map of distribution), who came to the conclusion that it is not possible to distinguish geographical races in *Saccopteryx bilineata,* this species occurs "from southern Mexico (Colima, Guerrero, and Vera Cruz) south to central Bolivia and Matto Grosso and Rio de Janeiro, Brazil", and on Trinidad.

Specimens examined.

Suriname; between 1824 and 1836, H. H. Dieperink; RMNH, reg. no. 17461: male, holotype of *Urocryptus bilineatus,* dried skin in a very poor condition, skull now extracted (= Jentink's 1888 *Saccopteryx bilineata,* no. a).

Suriname; date unknown, A. Kappler; ZMB, Nr. 3215, a-e: one female and four males, respectively; Nr. 3215, 1-3: three females; Nr. A4208: one female; Nr. 2974: one male; Nr. 3519, 1-4: four females; Nr. A1841, 1-6: four males and two females, respectively. All specimens preserved in alcohol, skulls extracted.

Suriname; 1866, A. Kappler; SMN, Nr. 1176a, 1-3: two females and one male, respectively, preserved in alcohol, skulls extracted.

Bank of Marowijne River, northeastern Suriname; 1877, C. Schneider; RMNH, reg. no. 17640: female, damaged skeleton with skull (= Jentink's 1887 *Saccopteryx leptura,* no. a).

Swamps behind Agricultural Experiment Gardens, District Beneden Suriname; March 20, 1939, H. W. C. Cossee; RMNH, reg. nos. 3925-3928, 3930, 3931, 3933, 3935-3942, 3944, 3945, and 3947: eighteen females; reg. nos. 3929, 3932, 3934, 3943, 3946, and 3948: six males. All specimens preserved in alcohol, skulls extracted.

Coastal region between Moengotapoe and Wiawia Bank, northeastern Suriname; between October 5 and November 16, 1948, Suriname Expedition 1948/1949; RMNH, reg. nos. 17469-17472, 17475, and 17476: six females, dried skins and skulls.

Nassau Mts., Marowijne River, Suriname; February 15, 1949, Suriname Expedition 1948/1949; RMNH, reg. nos. 17465-17468: one male and three females, respectively, dried skins and skulls.

Description. — Temminck (1838, pp. 33-34; pl. ii fig. 3: animal, dorsal view; fig. 4: head, right side view); Temminck (1841, pp. 301-302; pl. lvi

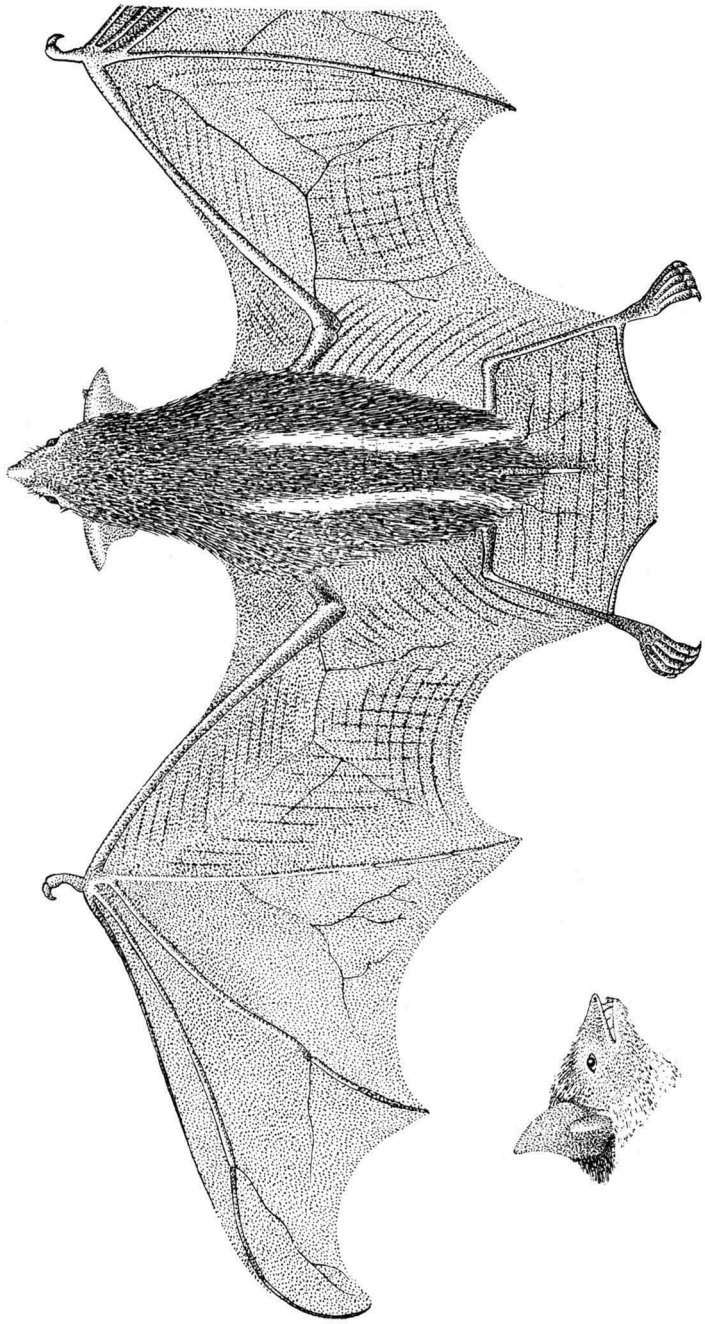

Fig. 4. *Urocryptus bilineatus* [= *Saccopteryx bilineata* (Temminck)]. After Temminck, 1838, pl. ii figs. 3 and 4. Original size.

figs. 3 and 4, these figures are exact, though mirror image copies of Temminck's 1838 figures); Dobson (1878, pp. 372-373); Miller (1899, pp. 176-178: *Saccopteryx perspicillifer*; fig. 2: skull); Miller (1907a, p. 89; fig. 2: skull of *S. perspicillifer*); Sanborn (1937, pp. 328-332; fig. 37: antebrachial membrane, dorsal view; fig. 39: map of distribution); Vieira (1942, pp. 239-240); Goodwin & Greenhall (1961, pp. 213-214: *S. bilineata perspicillifer*; fig. 4: head, front view; fig. 5: antebrachial membrane, dorsal view; fig. 6: skull, rostrum, dorsal view; fig. 7: skull, basisphenoid region; pl. 7 figs. 4-6: skull). The description given by Temminck in his 1841 paper is an exact French translation of his 1838 text.

Length of forearm in males varying from 44 to 49 mm, in females from 44.4 to 51.7 mm; ears about 15 mm long, with rounded tips, outer margin deeply concave in upper third, convex in lower two-thirds; upper lip projecting slightly beyond the lower lip; in the males the wing sac in the antebrachial membrane is situated close to the forearm near the elbow, opening on the dorsal surface of the membrane; on the ventral surface of this membrane the wing sac presents itself as a large swollen wrinkled pouch of about 9 mm long; in the females the wing sac is much smaller, sometimes even rudimentary. Interfemoral membrane well developed, when stretched extending to about the level of the bases of the toes; calcar about 17 mm long, conspicuously shorter than the tibia (which is about 22 mm), equal to the free margin of the interfemoral membrane; tail not reaching to the middle of the interfemoral membrane, perforating this membrane and appearing on its dorsal surface, the free end being up to 6 mm long; wing membranes from the ankles or from slightly above them on the tibia. The fur is soft and dense; dorsally it extends on the wing membranes as far as a line drawn from the proximal third of the upper arm to the knee, it is more loosely arranged on the interfemoral membrane and extends there to the exsertion of the tail. The fur of the wing membranes is less dense ventrally than dorsally, while the ventral surface of the antebrachial membrane as well as that of the interfemoral membrane are for their greater part covered with fine short whitish hairs; naked zones are usually found along the free margins of these membranes and along the thigh and tibia. The coat colour of the dorsal surface of the body is uniformly blackish brown or blackish, with the exception of two wavy longitudinal whitish or buffy white lines. These lines, which extend from about the shoulders either to the rump or to the base of the tail, are sometimes very distinct, but may be vague or interrupted; the hairs in these lines have only the tips white. In specimens with worn pelage the coat colour is more dark brownish. The colour of the ventral surface is more greyish brown; here the hairs are bicoloured, the basal two-thirds

are dark to blackish brown, the upper third is more greyish brown or buffy white. The membranes are blackish.

Dental formula: $\frac{1.1.2.3}{3.1.2.3}$. Upper incisors small, separated by distinct spaces from each other as well as from the canines; first premolar a simple spicule without anterior and posterior cusps, placed between the canine and the large second premolar without touching either; second premolar with its base of equal size as that of the canine, its shaft is about two-thirds the length of that of the canine; crowns of the molars distinctly lower than that of second premolar. Lower incisors small, trifid, forming a continuous row between the slender canines; first premolar with a broad base which equals that of the second premolar, touching the canine as well as the second premolar, the shaft of the first premolar is slightly more than half the length of that of the second premolar. Skull with interorbital constriction broad and postorbital constriction narrow, the two being separated by long and broad postorbital processes. The sagittal crest, which extends from the postorbital region to the supraoccipital bone, is distinct, varying in height from 0.4 to 0.6 mm. The large basisphenoid pit is divided by a well developed longitudinal septum.

The external and skull measurements of ten specimens from Suriname are given in Table II.

Remarks. — The holotype of *Urocryptus bilineatus* Temminck is present in the Leiden Museum under reg. no. 17461. The skin is in a very poor condition; after extraction the skull appeared to consist only of the rostrum (of which the anterior part of the palate is lacking), and the lower jaw (of which the condyli are broken off). The following measurements (in mm) could still be taken of the holotype: length of forearm, about 45; third metacarpal, 44; fourth metacarpal, 38.5; fifth metacarpal, 38; tibia, 21; hind foot, 10; interorbital constriction, 4.5; width across molars, 7.4; width across cingula canines, 4.2; length of upper tooth-row, 7.1; length of lower tooth-row, c-m_3, 7.4. These measurements agree very well with those of the other Suriname specimens examined by me, though the external dimensions are somewhat smaller than those given in Table II. Temminck's holotype is an adult male; the length of the wing sac is about 9 mm.

Sanborn (1937, pp. 331-332) showed that the present species varies greatly in size in the whole range of its distribution without giving rise to recognizable geographical races. The largest specimens, of which the length of the forearm varies from 44 to 51.7 mm, are found in the northern part of South America, from eastern Venezuela, Trinidad, and the Guianas to the Amazonas Province. Thomas (1904, p. 252) as well as Sanborn con-

TABLE II

External and skull measurements of ten specimens of *Saccopteryx bilineata* (Temminck) from Suriname.

Museum	RMNH	RMNH	RMNH	SMN	RMNH	RMNH	RMNH	RMNH	RMNH	RMNH
Reg. number	3934	3929	3946	1176a,3	3943	3926	3927	3930	3925	3928
Sex	♂	♂	♂	♂	♂	♀	♀	♀	♀	♀
Forearm	47.2	49.0	49.0	47.1	48.5	48.0	47.2	48.6	50.0	51.0
Third digit, metacarpal	45	48.5	46.5	45	48	48.5	46	48	48	49
1st phalanx	14.5	15.5	15.5	15	15.5	15	14.5	16	15	15
2nd phalanx	25	26	26	25	26	26	25	28	26	26
Fourth digit, metacarpal	40.5	42.5	41.5	40	44	43.5	41	43.5	42	43
1st phalanx	7.5	8	8.5	8.5	8.5	9	8	9.5	8	8.5
2nd phalanx	10	9.5	10	9.5	10	10	9.5	10.5	9.5	9.5
Fifth digit, metacarpal	37.5	40	40	38.5	40	40.5	38.5	41	40	41
1st phalanx	10.5	10.5	10.5	10.5	11	10.5	10	11.5	10	10.5
2nd phalanx	8.5	8.5	9.5	8.5	8.5	8.5	8	8.5	8	8.5
Tibia	21	22	23	21.5	22	22	21	22	22	22
Hind foot	10.5	11	11	11	10.5	10	10.5	12	10	11
Calcar	16	17	17	16	16	16	17	19	18	18
Skull:										
greatest length	17.0	17.1	17.1	17.3	—	16.7	16.7	17.2	17.3	17.4
condylobasal length from i	15.3	15.5	15.3	15.6	—	15.1	15.3	15.6	15.8	15.9
condyle to front of canine	15.1	15.4	15.2	15.5	15.5	15.0	15.1	15.4	15.5	15.5
basal length from i	13.8	14.1	13.8	13.8	—	13.6	13.7	14.1	14.4	14.3
palatal length from i	6.8	7.0	6.9	6.8	—	7.1	7.1	7.1	7.2	7.5
zygomatic breadth	10.9	11.4	10.8	10.8	11.2	10.6	11.0	10.5	11.2	10.6
breadth of braincase	8.2	8.2	8.1	8.3	8.0	8.0	7.9	8.0	8.3	8.0
height of braincase, without crest	6.7	6.8	6.7	6.8	6.7	6.9	6.7	6.8	6.7	6.5
mastoid breadth	8.7	9.0	8.7	9.1	8.8	8.6	8.7	8.7	8.8	8.9
interorbital constriction	4.1	4.5	4.0	4.6	4.7	4.9	4.5	4.8	4.9	4.5
postorbital constriction	2.5	2.6	2.6	2.7	2.6	2.6	2.6	2.6	2.5	2.5
width across molars	7.5	7.6	7.5	7.4	7.5	7.2	7.4	7.5	7.6	7.5
width across cingula canines	4.0	4.3	4.0	4.0	4.1	4.0	4.1	4.2	4.0	4.1
upper tooth-row, c - m^3	7.1	7.2	7.2	7.3	7.3	7.1	7.1	7.2	7.0	7.3
lower tooth-row, c - m_3	7.3	7.3	7.4	7.6	7.6	7.4	7.3	7.5	7.3	7.5
length of mandible	12.5	12.6	12.8	12.3	12.5	12.4	12.2	12.5	12.8	13.0

sidered *Saccopteryx perspicillifer,* described by Miller (1899, pp. 176-178; fig. 2) from Trinidad, to be a junior synonym of *S. bilineata.* Cabrera (1958, p. 50), however, regarded Miller's species as a good species, while Goodwin & Greenhall (1961, p. 213) treated it as a subspecies of *S. bilineata.* Judging by the published measurements of Miller's species and those of the typical *S. bilineata* from Suriname, there seems to be no good reason to separate the two forms even on subspecific level.

The localities whence the present species has been collected in Suriname show that it prefers the vicinity of water; Sanderson (1939, p. 263) also observed the species along the banks of rivers, namely the Coppename and Waijombo Rivers.

Saccopteryx leptura (Schreber)

(fig. 2d, pl. III)

Vespertilio Lepturus Schreber, 1774, Die Säugthiere, pl. lvii (name); 1775, Die Säugthiere, vol. 1, pp. 173-174 (description).
Vespertilio leptura, Collin, 1822, Fauna Surinamensis, p. 2.
Vespertilio lepturus, Lammens, 1844, Isis 1844, p. 109.
Saccopteryx lepturus, Krauss, 1846, Arch. Naturgesch., vol. 12, pt. 1, pp. 178-182; pl. vi.
Saccopteryx leptura, Dobson, 1878, Catalogue Chiroptera British Museum, p. 372.
Emballonura Septura, Kappler, 1881, Holländisch-Guiana, p. 163.
Saccopteryx leptura, Jentink, 1888, Mus. Hist. Nat. Pays-Bas, vol. 12, p. 197.
? *Saccopteryx,* Sanderson, 1939, Caribbean Treasure, p. 264.

Type locality. — "Surinam".

Distribution. — The species occurs from the Panama Canal Zone eastward through Venezuela, Tobago and Trinidad, and the Guianas, to northeastern Brazil and southward to southwestern Peru (see Sanborn, 1937, fig. 40: map of distribution).

Specimens examined.

Suriname; 1857, A. Kappler; SMN, Nr. 3587, 1 and 2: one male and one female, preserved in alcohol, skulls extracted.

Suriname; date unknown, A. Kappler; ZMB, Nr. 3215, 1 and 2: two females, preserved in alcohol, skulls extracted; Nr. 3215, 3: male, preserved in alcohol, skull inside.

Suriname; date unknown, A. Kappler; ZMB, Nr. 3982: one male, preserved in alcohol, skull inside; Nr. 3982, 1 and 2: one male and one female, preserved in alcohol, skulls extracted.

Suriname; date unknown, A. Kappler; ZMB, Nr. 1840, 2 and 4208, 3: one male and one female, respectively, preserved in alcohol, skulls extracted.

Suriname; 1886, H. ten Kate; RMNH, reg. nos. 17543 and 17544: one female and one male, respectively, preserved in alcohol, skulls inside (= Jentink's 1888 *S. leptura,* nos. a and b).

Suriname; date unknown, Van Brussel; ZMA, no. 1651: one female, preserved in alcohol, skull extracted.

Zorg en Hoop, Paramaribo; April 29, 1956, J. van der Kamp; ZMA: one female, preserved in alcohol, skull extracted.

Coastal region between Moengotapoe and Wiawia Bank, eastern Suriname; October 8 — November 28, 1948, Suriname Expedition 1948/1949; RMNH, reg. nos. 17579, 17581, 17583, and 17586: five males; reg. nos. 17580, 17582, 17587, and 17588: four females. All specimens preserved as dried skins and skulls.

Tibiti River, northern part of central Suriname; Januari 14, 1949, Suriname Expedition 1948/1949; RMNH, reg. no. 17585: one male, dried skin and skull.

Neighbourhood of Paramaribo; Februari 24, 1961, H. A. Beatty; CNHM, nos. 93220 and 93224: two females, dried skins and damaged skulls.

Description. — Schreber (1774-1775, pp. 173-174; pl. lvii: right wing, ventral view, and animal with folded wing, left side view); Krauss (1846; pl. vi fig. 1: skull; fig. 2: left wing, ventral view; fig. 3: left wing, dorsal view); Dobson (1878, pp. 371-372); Miller (1907a, p. 89); Sanborn (1937, pp. 332-334; fig. 40: map of distribution); Vieira (1942, pp. 237-238); Goodwin & Greenhall (1961, pp. 214-215; pl. 7 figs. 7-9: skull).

Length of forearm varying in males from 37.4 to 40 mm, in females from 39.1 to 42.3 mm; muzzle slightly projecting beyond the lower lip; ears narrow, about 12 mm long; interfemoral membrane well developed, when stretched extending to about the toes or beyond the feet; calcar, about 14 mm long, two or three millimeters shorter than the tibia, and about two and a half times as long as the free margin of the interfemoral membrane; in the males the ventral surface of the interfemoral membrane shows close to the forearm near the elbow a large, swollen wing sac of about 6 mm long, opening on the dorsal surface of the membrane; in females this pouch is rudimentary or absent; wing membranes from the ankles or from the proximal part of the metatarsus. Fur soft and dense; on the dorsal surface of the wing membrane it reaches as far as a line drawn from the distal third of the upper arm to the knee; it covers the thighs dorsally and extends on the interfemoral membrane to the exsertion of the tail. On the ventral surface the extent of the fur is quite similar to that of the dorsal surface but it is less dense, while the whole of the interfemoral membrane is covered with short fine hairs, which are sparse on a broad zone along the tibia. The colour of the dorsal surface is uniformly dark brown, with the exception of two faint, longitudinal whitish wavy lines, which extend from behind the shoulders to the rump; in these lines, which are often very indistinct, the tips of the hairs are whitish or light yellowish. The colour of the ventral surface of the body is lighter than that of the dorsal since the distal third of the ventral hairs is light yellowish brown, the basal two-thirds being dark brown. The wings are blackish brown.

Dentition: $\frac{1.1.2.3}{3.1.2.3}$. Skull and teeth essentially like in *Saccopteryx bilineata,* but much smaller in all dimensions. The sagittal crest is sharply defined

but low, usually less than 0.2 mm (in *S. bilineata* the height of the crest varies from 0.4 to 0.6 mm). The deep and large basisphenoid pits are divided by a low longitudinal septum.

The external and skull measurements of six Suriname specimens of the present species are given in Table III.

Remarks. — *Saccopteryx leptura* is the only species of bat mentioned by Collin (1822, p. 2) in his "Fauna Surinamensis". As pointed out by Holthuis (1958), Collin's paper is "a rather uncritical list". As to the mammals, Collin evidently only included such species as were expressly indicated with the words "Habitat in Surinamo" by Gmelin in the thirteenth edition of Linnaeus's Systema Naturae (1789, vol. 1, pp. 14-232).

The specimens of *Saccopteryx leptura* in the Leiden Museum mainly date from recent years. In his 1888 Catalogue Jentink listed two specimens collected in 1886 in Suriname (a more exact locality not given). Temminck (1838, p. 21; 1841, p. 292) had no Suriname material of the species at his disposal and remarked (1841, p. 292): "Il est dit que l'espèce vient de Surinam, mais Mr. Geoffroy en doute; je puis ajouter, que depuis un grand nombre d'années que le musée des Pays-Bas fait faire des recherches et reçoit des objets d'histoire naturelle de la Guyane hollandaise, une espèce semblable à celle dont Schreber fait mention, ne lui est pas encore parvenue". This means that H. H. Dieperink, who between 1824 and 1836 had sent important collections of Suriname mammals to the Leiden Museum, evidently had not obtained any specimen of *Saccopteryx leptura.* Though Lammens (1844, p. 109) listed the present species in his paper on Suriname mammals, he referred only to Zimmermann's book without giving a description of the species as was done by him for the other species, which he himself had observed or collected in Suriname; it is therefore most probable that Lammens himself never saw *S. leptura,* or did not recognize it as such. That the species at that time was not rare in Suriname is shown by the fact that Kappler sent to the Berlin and Stuttgart Museums at least the eight specimens that were examined by me. One of Kappler's specimens in the Stuttgart Museum has been extensively dealt with by Krauss (1846).

The differences in coat colour of *Saccopteryx bilineata, S. leptura,* and *S. canescens* can not always be relied upon to distinguish these species. However, the much greater length of the forearm and that of the tooth-row of *S. bilineata* distinguish this species immediately from the other two. *S. leptura* differs from *S. canescens* in the larger dimensions of the skull; the ranges of the length of the forearm in the two species overlap.

TABLE III

External and skull measurements of six specimens of *Saccopteryx leptura* (Schreber) and of four specimens of *Saccopteryx canescens* Thomas from Suriname.

	Saccopteryx leptura						*Saccopteryx canescens*			
Museum	SMN	ZMB	RMNH	ZMB	RMNH	ZMB	SMN	ZMB	RMNH	ZMH
Reg. number	3587,1	3982,1	17584	3982,2	17587	A1840,2	3587,3	A4208,4	12090	23517
Sex	♂	♂	♂	♀	♀	♀	♂	♂	♀	♀
Forearm	38.5	39.6	37.5	40.6	39.0	40.5	36.3	36.3	39	39.8
Third digit, metacarpal	37.5	39	36.5	40	37.5	38.5	36	35	—	39
1st phalanx	11.5	11.5	10.5	12	10	12	11.5	11.5	—	12
2nd phalanx	23	22	21	22	20	23	20	17	—	17
Fourth digit, metacarpal	32.5	33.5	32	35.5	35	35	31.5	31	—	34.5
1st phalanx	7	6.5	7	7	7.5	7	7	7	—	6
2nd phalanx	8	7.5	8	7.5	8.5	7.5	7	7	—	7.5
Fifth digit, metacarpal	30.5	32	29.5	33	32.5	32	29.5	30.5	—	33.5
1st phalanx	8.5	7.5	8.5	8.5	9	8.5	8	8	—	7.5
2nd phalanx	7.5	6	6.5	6.5	6.5	6.5	5.5	5	—	5.5
Tibia	16	15	15	17	16	17	14.5	13.5	—	15
Hind foot	8	8	7.5	8	8	8	7	6.5	—	7
Calcar	13.5	13	13	14	—	14	12.5	13.5	—	14
Skull:										
greatest length	13.8	13.9	14.2	13.6	13.9	14.2	12.7	13.0	12.7	13.0
condylobasal length	12.3	12.5	12.5	12.3	12.5	12.8	11.4	11.3	11.3	11.9
condyle to front of canine	12.3	12.5	12.3	12.3	12.2	12.7	11.4	11.3	11.2	11.8
basal length from i	10.8	11.0	11.3	11.0	11.4	11.3	10.2	10.5	9.5	10.5
palatal length from i	5.1	5.1	5.3	4.9	5.1	5.1	4.5	4.7	4.6	5.1
zygomatic breadth	—	9.0	9.1	9.0	9.1	8.8	7.7	7.9	8.0	8.0
breadth of braincase	7.1	7.0	7.4	6.7	7.0	6.8	6.3	6.3	6.4	6.1
height of braincase	6.0	5.8	5.9	5.8	5.9	5.9	5.1	5.1	5.4	5.3
mastoid breadth	7.2	7.6	7.4	7.2	7.3	7.3	6.6	6.8	6.6	6.6
interorbital constriction	3.0	3.4	3.4	4.0	3.5	3.5	—	2.8	2.1	2.2
postorbital constriction	2.4	2.2	2.2	2.2	2.5	2.3	2.2	2.1	—	—
width across molars	6.1	6.0	6.1	6.2	6.0	5.8	5.3	5.3	5.2	5.5
width across cingula canines	3.2	3.1	3.0	3.3	3.2	3.1	2.7	2.7	2.9	2.8
upper tooth-row, c - m^3	5.3	5.3	5.4	5.5	5.3	5.3	5.0	5.0	4.7	5.1
lower tooth-row, c - m_3	5.4	5.4	5.4	5.5	5.3	5.3	5.1	5.1	5.0	5.2
length of mandible	9.8	9.9	9.7	9.9	10.0	9.5	8.5	8.8	8.7	8.9

Saccopteryx canescens Thomas

(fig. 2c)

Saccopteryx canescens Thomas, 1901, Ann. Mag. Nat. Hist., ser. 7, vol. 7, pp. 366-367.

Type locality. — "Obidos, on the Amazon", Brazil.

Distribution. — According to Sanborn (1937, pp. 334-335; fig. 41: map of distribution) the species occurs "from northern Colombia south through central Peru and east to French Guiana and the Amazon basin".

Specimens examined.

Tibiti River, Basiskamp, northern part of central Suriname; January 17, 1949, Suriname Expedition 1948/1949; RMNH, reg. no. 12090: female, dried skin and skull.

Paramaribo; September 30, 1898, I. Michaelis; ZMH, Nr. 23517: female, preserved in alcohol, skull extracted.

Paramaribo; February 24, 1961, H. A. Beatty; CNHM, nos. 93221-93223: three females, dried skins and damaged skulls.

Suriname; 1857, A. Kappler; SMN, Nr. 3587,3: male, preserved in alcohol, skull extracted.

Suriname; date unknown, A. Kappler; ZMB, Nr. A 4208,4: male, preserved in alcohol, skull extracted.

Description. — Thomas (1901c, pp. 366-367); Sanborn (1937, pp. 334-335; fig. 41: map of distribution); Vieira (1942, pp. 240-241).

Length of forearm varying from 34.4 to 40.8 mm; length of ear about 11 mm; interfemoral membrane, when stretched, extending beyond the toes; calcar (about 15 mm) slightly shorter than the tibia (about 16 mm); wing sac short, close to the forearm near the elbow and opening on the dorsal surface of the antebrachial membrane; wing membranes from the ankles or from the proximal part of the metatarsus. Fur soft and dense, extending on the wing membranes, above and beneath, as far as a line drawn from the distal third of the humerus to the knee, and on the dorsal surface of the interfemoral membrane to the distal part of the tail; the ventral surface of the interfemoral membrane is sparsely clothed with short fine hairs. The colour of the dorsal surface varies from greyish brown to brownish with a grizzled appearance, it is usually darkest brown between the two whitish longitudinal stripes, which in some specimens are distinct, in others hardly visible; the hairs of the dorsal surface are bicoloured, the basal three-fourths dark brown, the tips whitish, light yellowish brown or buffy. The colour of the ventral surface is distinctly lighter than that of the back, the basal half of the hairs is dark brown to plumbeous, the upper half greyish or buffy. The wing membranes are blackish brown.

Dental formula: $\frac{1.1.2.3}{3.1.2.3}$. Skull and teeth essentially like in *Saccopteryx bilineata,* but in all dimensions much smaller.

The external and skull measurements of four specimens are given in Table III.

Remarks. — In the original description of *Saccopteryx canescens,* Thomas (1901c, p. 366) stated that he also examined material of the species from Suriname. The coat colour of this smallest of the Suriname Emballonurinae proves to be variable, at least in the specimens examined. The grizzled appearance of the dorsal surface of the body is present in all specimens, while the colour of the ventral surface is much lighter, more washed with grey, than that of the dorsal surface. The extent and the distinctness of the whitish longitudinal dorsal lines vary strongly.

Sanborn (1937, pp. 334-335) quite correctly considered *Saccopteryx pumila,* originally described by Thomas (1914, pp. 410-411) from Venezuela (and reported by him also from French Guiana), to be identical with *S. canescens.* My material fully supports Sanborn's arguments for the synonymizing of the two species. In my Suriname specimens the length of the upper tooth-row falls within the range of variation as given by Sanborn for the true *S. canescens,* while the three skulls seen by me in which the basisphenoid pit is entire, show a median septum of this basisphenoid pit. Admittedly this septum is low and extends only half-way down the pit. It is not clear why Cabrera (1958, p. 50) still kept the two species separated.

Cormura brevirostris (Wagner)

(fig. 2e; pl. III)

Emballonura brevirostris Wagner, 1843, Arch. Naturgesch., vol. 9, pt. 1, p. 367.
Myropteryx pullus Miller, 1906, Proc. Biol. Soc. Washington, vol. 19, pp. 59-60.

Type locality. — The type locality of *Emballonura brevirostris* is "Marabitanas", Rio Negro, Amazonas, Brazil; that of *Myropteryx pullus* is "Surinam".

Distribution. — The present species has been reported from Nicaragua, Costa Rica, Panama, Ecuador, Peru, Venezuela, Suriname, and the Amazon Basin and the Matto Grosso in Brazil (see Sanborn, 1937, fig. 47: map of distribution).

Specimens examined.

Suriname; date unknown, A. Kappler; ZMB, Nr. 3360: female, holotype of *Myropteryx pullus,* preserved in alcohol, skull probably lost; Nr. 3360a, male, paratype, preserved in alcohol, strongly damaged skull extracted.

Suriname; date unknown, H. B. Möschler; ZMB, Nr. 4522; male, preserved in alcohol, skin only (received from the British Museum (N.H.) on November 5, 1912).

Coastal region between Moengotapoe and Wiawia Bank, northeastern Suriname; between October 5 and November 16, 1948, Suriname Expedition 1948/1949; RMNH,

reg. nos. 17491, 17492, 17496, 17497, and 17498: five males; reg. nos. 17489, 17493, 17494, and 17495: four females. All specimens have been preserved as dried skins and skulls.

Galibi, left bank of the mouth of the Marowijne River, northeastern Suriname; November 6, 1948, Suriname Expedition 1948/1949; RMNH, reg. no. 17490: male, dried skin and skull.

Description. — Wagner (1843, p. 367); Wagner (1847, pp. 187-188); Peters (1867, pp. 475-476; plate opposite p. 482 figs. 1 and 1a: head; 1b: interfemoral membrane; 1c-f: skull); Dobson (1878, pp. 375-376); Miller (1907a, p. 90: *Cormura*; pp. 91-92: *Myropteryx*); Thomas (1913a, pp. 133-134); Sanborn (1937, pp. 348-350: *Cormura*; fig. 37: antebrachial membrane; pp. 350-351: *Myropteryx*; fig. 47: map of distribution of the two genera); Vieira (1942, pp. 243-245; fig. 3: animal, ventral view). The original description by Wagner (1843) is extremely short: E. (mballonura) auriculus abbreviatis latiusculis; rostro brevi tumido acuminato; alis metatarso affixis. Antebrachiam 1″ 8½‴.

Length of forearm varying in the examined Suriname specimens from 41.5 to 47.0 mm; length of ears from meatus, about 12 mm; ear conch triangular, rounded above; tragus more or less rectangular, about one-third the length of the ear; wing sac about in the centre of the antebrachial membrane, extending from near the anterior border of the free margin of the membrane to near the elbow, up to 7 mm long, slightly more developed in males than in females; interfemoral membrane well developed, when stretched reaching slightly beyond the hind foot; tail not reaching to the middle of the interfemoral membrane, perforating it and appearing on its dorsal surface, the length of its free end varying from 1 to 3 mm; calcar usually slightly shorter than the tibia, but distinctly longer than the free margin of the interfemoral membrane; hind foot relatively short, much less than half the length of the tibia; wing membrane from the distal half of the metatarsus near the base of the outer toe. Fur soft and dense, above and beneath extending on the wing membrane as far as a line drawn from the middle of the upper arm to the middle of the thigh; the ventral surface of the interfemoral membrane is sparsely covered with short whitish hairs, often restricted to the sides of the tail. Two colour phases occur: one bright reddish brown, the other more dark brown; in both phases both the dorsal and the ventral hairs are unicoloured, the extreme base of the hairs only is somewhat lighter; the ventral surface of the body is slightly paler than the dorsal. The wings are dark to blackish brown.

Dental formula: $\frac{1.1.2.3}{3.1.2.3}$. Upper incisors minute, probably deciduous in early stage in most specimens; first upper premolar small, rounded, with distinct anterior and posterior cusps, almost or actually touching the canine,

but separated by a distinct space from the large second premolar; it reaches to or slightly beyond the middle of the height of the cingulum of the canine; the large second premolar touches the first molar, its shaft being distinctly higher than the crown of the latter. Lower incisors small, trifid, forming a continuous row between the slender canines; first lower premolar triangular with distinct anterior and posterior cusps, which touch the canine as well as the second premolar; the first premolar is as high as or slightly higher than the anterior margin of the cingulum of the canine, it is about half as high as the second premolar. The sagittal crest is well developed, its height being up to 0.7 mm in males, up to 0.4 mm in females; it extends from the postorbital region to the supraoccipital bone. In the five undamaged Suriname skulls seen by me the posterior margin of the palate ends distinctly behind the last molar; this margin is V-shaped. These five skulls show no septum dividing the basisphenoid pit.

The external and skull measurements of ten specimens from Suriname are given in Table IV.

Remarks. — Professor Dr. K. Zimmermann of the Berlin Museum kindly sent me on loan the holotype (ZMB, Nr. 3360) and one paratype (ZMB, Nr. 3360a) of *Myropteryx pullus*. The skull of the holotype must be considered lost, that of the paratype was still inside. After extraction it proved to consist of a few fragments only, viz., right and left upper tooth-row (canine, premolars and molars), and mandible.

The genus *Myropteryx* with its type species *M. pullus* was described by Miller (1906b), who based his description on four specimens in the Berlin Museum, which were collected by A. Kappler at an unknown date in Suriname, most probably in the northeastern part of this country since Kappler spent most of his time (1842-1879) in Albina on the Marowijne River; these specimens were, according to Miller himself, labelled by Peters as *Cormura brevirostris*. It is unknown whether Peters (1867) already knew these specimens when he gave a redescription of the type of *C. brevirostris*, which is held by the Vienna Museum; in his paper, however, Peters made no mention of Suriname material of this species. Miller (1960b) separated his *Myropteryx* from *Cormura* mainly on the "complete absence of hypocones in the upper molars" and on the "great reduction of the upper incisors". Thomas (1913a, pp. 133-134) re-examined Miller's two specimens of *Myropteryx* and compared them with the type of *Cormura brevirostris* in the Vienna Museum, which he found to be "unfortunately now without skull". Thomas discussed the characters dealt with by Miller to separate the two genera, and came to the conclusion that with the material at his disposal there was no good reason to maintain the two genera as distinct. Sanborn (1937, pp.

TABLE IV

External and skull measurements of ten specimens of *Cormura brevirostris* (Wagner) from Suriname. ZMB reg. no. 3360 is the holotype of *Myropteryx pullus* Miller.

Museum	ZMB	RMNH	RMNH	RMNH	RMNH	RMNH	ZMB	RMNH	RMNH	ZMB
Reg. number	3360	17494	17493	17489	17498	17491	4522	17497	17490	3360, a
Sex	♀	♀	♀	♀	♂	♂	♂	♂	♂	♂
Forearm	45.0	41.5	44.5	45.1	41.5	44.0	45.6	46	46.5	47.0
Third digit, metacarpal	40.5	40.5	42	41.5	40.5	40.5	40	42	42	41
1st phalanx	14	12	14	13	12	12	13	13	13	13
2nd phalanx	22	22	20	22	20	22	21	19	20	21
Fourth digit, metacarpal	34.5	34.5	35.5	35	33	35	34.5	35	36	34
1st phalanx	10	10	10.5	10	10	9.5	9	10	10	10
2nd phalanx	8	7.5	7.5	—	7	6	7	7.5	7.5	7
Fifth digit, metacarpal	32.0	30.5	33.5	31.5	31	31.5	32	32.5	34	32
1st phalanx	11	11	11.5	11	11	11	11	11	11	11
2nd phalanx	7	7	7	—	7	5	7	7	7	6
Tibia	16	15	16	15	15.5	15	16	16.5	16	16
Hind foot	7	7	—	7	7	6.5	7	7	7	7
Calcar	14	14	13.5	15	13	14.5	15	13	—	15.5
Skull:										
greatest length	—	—	15.3	15.1	—	15.8	—	—	15.4	—
condylobasal length	—	—	—	—	—	14.7	—	—	—	—
condyle to front of canine	—	13.9	14.3	13.6	—	14.3	—	—	13.8	—
basal length	—	—	12.7	11.3	—	13.0	—	—	11.7	—
palatal length	—	—	6.4	5.2	—	7.3	—	6.1	5.4	—
zygomatic breadth	—	—	10.0	9.6	—	10.0	—	—	9.8	—
breadth of braincase	—	7.8	7.6	7.7	—	7.8	—	—	7.5	—
height of braincase, without crest	—	6.0	6.2	6.1	—	6.3	—	—	6.0	—
mastoid breadth	—	8.8	8.8	8.3	—	8.8	—	—	8.5	—
interorbital constriction	—	4.7	4.9	4.9	—	4.5	—	—	5.0	—
postorbital constriction	—	2.7	2.8	3.0	—	2.8	—	3.2	2.8	—
width across molars	—	—	7.4	7.2	6.9	7.4	—	—	7.4	—
width across cingula canines	—	—	3.8	3.8	3.7	3.8	—	—	3.7	—
upper tooth-row, c - m^3	—	6.2	6.3	6.2	6.2	6.2	—	6.3	6.2	6.3
lower tooth-row, c - m_3	—	6.5	6.3	6.3	6.4	6.5	—	6.5	6.5	6.6
length of mandible	—	11.1	11.3	11.1	11.2	11.0	—	11.3	11.2	11.2

350-351) resurrected *Myropteryx* as a good genus, mainly on the authority of Dr. W. H. Osgood, who "states in his notes that the species *pullus* may stand, as specimens from Para have relatively narrow skulls", and on the fact that some characters of *Myropteryx* are still to be checked ("the shape of pm^2, the point of attachment of the wings, the amount of fur at the base of the interfemoral, and the exact shape and size of the wing sac"). Also Simpson (1945, p. 56) maintained the generic status of *Myropteryx*, while Cabrera (1958, pp. 50-51) placed *Myropteryx pullus* in the synonymy of *Cormura brevirostris*.

The examination of the holotype and the paratype of *M. pullus* enabled me to obtain some information on the points that Sanborn still considered dubious.

(a) the shape of the first upper premolar. As mentioned above the skull of the holotype of *M. pullus* must to be considered lost, while that of one of the paratypes examined by me consists of some fragments. In the paratype the first upper premolar is present in both jaws; this tooth is rounded, with distinct anterior and posterior cusps, it is placed nearer to the canine than to the second premolar, and reaches only slightly beyond the middle of the height of the cingulum of the canine. The figures of the upper and lower tooth-rows of *Cormura brevirostris* as given by Peters (1867, plate opposite p. 482 fig. 1f) agree perfectly with the situation as it is found in the paratype of *Myropteryx pullus*.

(b) the point of attachment of the wings. In the holotype of *Myropteryx pullus* as well as in the paratype examined by me the wing membrane is attached to the distal part of the metatarsus, slightly above the base of the outer toe. Peters's fig. 1b of the type of *Cormura brevirostris* shows exactly the situation as this is found in *Myropteryx*.

(c) the amount of the fur at the base of the interfemoral membrane. The situation figured by Peters in his fig. 1b for *Cormura* is also found in the type material of *Myropteryx*.

(d) the exact shape and size of the wing sac. The type material of *Myropteryx* shows the shape, size and situation of the wing sac as figured by Sanborn (1937, fig. 37) for *Cormura*.

The above mentioned characters of the type material of *Myropteryx pullus* combined with the result of Thomas's (1913a, pp. 133-134) investigation on *Cormura* and *Myropteryx* lead, as far as I can see, to the definite conclusion that there is no reason to maintain Miller's *Myropteryx* as distinct from *Cormura*. Another question is, however, whether or not it is justified to consider *Cormura pullus* specifically or subspecifically different from the typical *C. brevirostris*. The type material of *Myropteryx pullus* agrees in

all essential characters with the other Suriname specimens of *Cormura* examined by me, which originate from the same region as where Kappler has probably collected his specimens. Basing myself on the measurements given by Sanborn (1937, pp. 348-349) for *Cormura brevirostris* from the whole range of distribution of the species, there is no indication that the Suriname specimens should be separated taxonomically from those of the other regions; for this reason I accept *Myropteryx pullus* as a junior synonym of *Cormura brevirostris.*

The external measurements of the holotype of *Myropteryx pullus* given in Table IV differ slightly from those given by Miller (1906) in the original description of the species; these differences are evidently due to different methods of taking these measurements. Of the examined Suriname specimens of the present species only one skull has the anterior margin of the premaxillaries undamaged; in this skull no trace of upper incisors could be observed. The data found in the literature make it highly desirable to examine skulls with undamaged premaxillaries in order to obtain a correct idea about the size and the presence or absence of the upper incisors.

Peropteryx kappleri kappleri Peters

(fig. 1c)

Peropteryx Kappleri Peters, 1867, Monatsber. Akad. Wiss. Berlin 1867, pp. 473-474.

Type locality. — "Surinam".

Distribution. — The species has a wide range of distribution from southeastern Brazil and Peru through northern South America and Central America north to S. Mexico (Veracruz). The somewhat smaller Peruvian form has been described by Sanborn (1951b, p. 476) as subspecifically different from the typical form under the name *Peropteryx kappleri intermedia.*

Specimen examined.

Suriname; date unknown, A. Kappler; ZMB, Nr. 3348: holotype (?), female, preserved in alcohol, skull outside (probably lost).

Description. — Peters (1867, pp. 473-474); Robinson & Lyon (1901, pp. 158-159); Miller (1907a, p. 90); Sanborn (1937, pp. 343-345; fig. 37: antebrachial membrane; fig. 44: map of distribution); Vieira (1942, pp. 234-235).

Length of forearm varying from 45 to 53.6 mm; ear length, about 18 mm; interfemoral membrane, when stretched, reaching to the foot; wing sac short, on the anterior edge of the antebrachial membrane; calcar (about 17.5 mm)

shorter than the tibia (about 19.5 mm), about as long as the free margin of the interfemoral membrane; wing membranes from the ankles. According to Sanborn (1937, p. 343) "there are two color phases; one is close to mummy brown and the other is a little darker than Prout's brown. In both, the underparts are slightly lighter".

Dental formula: $\frac{1.1.2.3}{3.1.2.3}$. Upper incisors small, separated by a distinct space from each other as well as from the canines; first upper premolar a structureless spicule, separated by a space from the second premolar. Lower teeth essentially like those of *Saccopteryx bilineata*. The rostrum is sharply set off by an angle from the braincase, the dorsal surface of the rostrum is nearly parallel to the tooth-row; the basisphenoid pit is not divided by a septum.

In my opinion it is almost certain that the above mentioned specimen from the Berlin Museum is the holotype of *Peropteryx kappleri* Peters. The specimen itself is not labelled, while the inscription on the label affixed to the jar in which it is preserved is difficult to decipher; as far as I can see, however, it contains no indication referring to a type. Unfortunately the skull was extracted and is no longer with the specimen; it could not be found in the Berlin Museum, and must probably be considered lost. The external measurements of the present specimen taken by me agree so well with those given by Peters of his type that the identity of the two seems highly probable. The differences in the lengths of the forearm and of the metacarpals found by me may be due to a different method of measuring; the remarkable difference in the length of the second phalanx of the third digit can be explained by assuming that Peters measured the length of the curved outline, while I took the shortest distance between the extreme tip of the second phalanx and the articulation between the first and second phalanges. The following measurements were taken by me, in parentheses Peters's measurements of the holotype are given: forearm, 51.6 (50); length of third metacarpal, 47 (45); first phalanx, 15 (15) second; phalanx, 24 (27); length of fourth metacarpal, 39.5 (38); first phalanx, 10.5 (10); second phalanx, 10 (10); length of fifth metacarpal, 37.5 (36); first phalanx, 12 (12); second phalanx, 7 (7.5); length of ear from meatus, 14 (13.5); tragus, 6 (5.5); tibia, 21 (20); hind foot, 10.5 (10); calcar, 17 (17); length of tail from anus, 15 (16). The tail is free for about 2 mm; the calcar is somewhat shorter than the free margin of the interfemoral membrane.

The following are the ranges of variation of the skull measurements as given by Sanborn (1937, p. 343): skull, greatest length, 16-17.8; condylobasal length, 14.1-16.2; palatal length, 6.3-7.1; zygomatic breadth, 9.5-10.9;

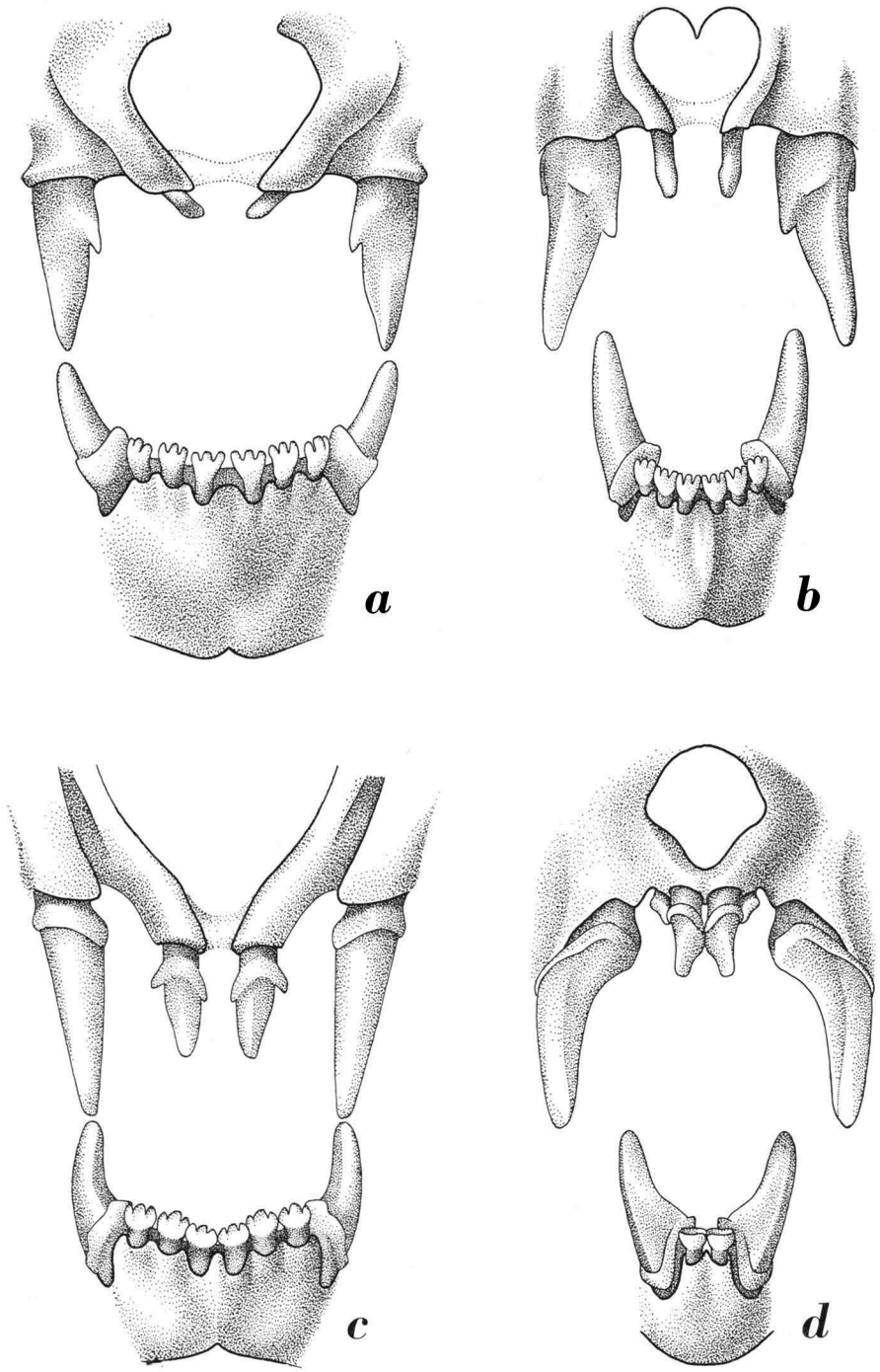

Fig. 5. Canines and incisors in front view. a, *Rhynchonycteris naso* (Wied), RMNH, reg. no. 3917; b, *Saccopteryx bilineata* (Temminck), ZMB, Nr. A 1841, 1; c, *Diclidurus scutatus* Peters, RMNH, reg. no. 17361; d, *Noctilio leporinus leporinus* (L.), RMNH, reg. no. 13490. Width across cingula canines in mm: a, 3.2; b, 4.1; c, 3.9; d, 9.5.

breadth of braincase, 7.1-8; mastoid breadth, 8.1-9; interorbital constriction, 2.6-3.5; width across molars, 7-8.3; width across cingula canines, 4.1-5.2; upper tooth-row, c-m^3, 6.8-7.8.

Remarks. — *Peropteryx kappleri kappleri* seems to be rare in Suriname; though I examined a rather great number of Suriname Emballonurinae I did not see any specimen of this species, apart from the above mentioned supposed holotype. According to Sanborn (1937, p. 344) "the members of the genus *Peropteryx* have often been reported from very shallow caves or from crevices between boulders where light can enter". Since in Suriname bats never have been systematically collected, it is very likely that such places have not been thoroughly explored. This also may explain why the widely distributed species *Peropteryx macrotis macrotis* (Wagner) so far has not been reported from Suriname. This latter species is on an average smaller than *P. kappleri* (see the key on page 28); for its description I refer to Dobson (1878, pp. 373-374: *Saccopteryx canina*), Sanborn (1937, pp. 339-341; fig. 43: map of distribution), Husson (1960, pp. 57-59; fig. 9: head, front and right side views; pl. 12: skull), and Goodwin & Greenhall (1961, pp. 215-216; figs. 8-11: head, antebrachial membrane, rostrum and palate of skull; pl. 8 figs. 1-3: skull).

Peronymus leucopterus leucopterus (Peters)

(fig. 2f)

Peropteryx leucoptera Peters, 1867, Monatsber. Akad. Wiss. Berlin 1867, p. 474.

Type locality. — "Surinam".

Distribution. — The typical form has been reported from southern Venezuela, Suriname, and the Amazon basin (see Sanborn, 1937, fig. 46: map of distribution). A second subspecies, *Peronymus leucopterus cyclops* Thomas, is only known from Peru.

Specimens examined.

Suriname; date unknown, A. Kappler; ZMB, Nr. A 1840, 1, and A 4208: two males, preserved in alcohol, skulls extracted.

Suriname; date unknown, A. Kappler; ZMB, Nr. A, B, A 1839, 3349, 1 and 2, and A 4208, 1: six females, preserved in alcohol, skulls extracted (Nr. 3349, 2: without skull).

Description. — Peters (1867, p. 474); Dobson (1878, pp. 374-375: *Saccopteryx leucoptera*); Miller (1907a, pp. 90-91); Sanborn (1937, pp. 345-348; fig. 37: antebrachial membrane; fig 45: skull; fig. 46: map of distribution).

Length of forearm varying in males from 40.9 to 44.6 mm, in females from 42.2 to 47 mm; ears united across the forehead by a low band with

a deep notch in the centre; interfemoral membrane, when stretched, extending to the toes; calcar (about 14 mm) equal to or slightly shorter than the tibia (about 15 mm), about one and a half times as long as the free margin of the interfemoral membrane; wing membrane from the ankles or from the proximal part of the metatarsus; wing sac short, situated on the upper edge of the antebrachial membrane approximately above the middle of the upper arm. Fur soft and dense, extending on the dorsal surface of the wing membranes as far as a line drawn from about the middle of the upper arm to the knee, and on the interfemoral membrane extending to the point of exit of the tail; on the ventral surface the fur extends on the wing membranes as far as a line drawn from the proximal third of the upper arm to the basal part of the thigh, while the entire interfemoral membrane is clothed with short fine hairs. The coat colour is dark brown above, somewhat paler beneath; distal parts of the wing membranes are white from at least a line drawn from the elbow to the knee, the antebrachial and the interfemoral membranes are dark brown.

Dental formula: $\frac{1.1.2.3}{3.1.2.3}$. Upper incisors slender and small, separated by a distinct space from each other as well as from the canines; first upper premolar small, about twice as wide as the incisors, without anterior or posterior cusps, standing in about the centre of the space between the canine and the large, second premolar; the basis of the second premolar slightly shorter than that of the canine, its shaft about two-thirds as high as that of the canine. Lower teeth essentially similar to those of *Saccopteryx bilineata.* The basisphenoid pit is deep, not divided by a plate; there are two large lateral pterygoid pits at its anterior end (see Sanborn, 1937, fig. 45).

The external and skull measurements of seven specimens from Suriname are given in Table V.

Remarks. — The most striking characters of the present species are the following: (a) the ears are connected across the forehead by a low band, (b) the greater part of the wing membranes are white, and (c) the deep basisphenoid pit is undivided by a plate, and has two large lateral pterygoid pits at its anterior end.

The present species was originally placed by Peters (1867, p. 474) in the genus *Peropteryx,* but one year later Peters (1868a, p. 145) erected the subgenus *Peronymus* for it. Still later, Dobson (1878, p. 374) placed the species of both the genera *Peropteryx* and *Peronymus* in the genus *Saccopteryx.* Miller (1907a, pp. 90-91) considered *Peropteryx* and *Peronymus* good genera, as did also Sanborn (1937). Simpson (1945, p. 55) included *Peronymus* again in *Saccopteryx,* together with *Cormura, Peropteryx, Cen-*

TABLE V

External and skull measurements of seven specimens of *Peronymus leucopterus leucopterus* (Peters) from Suriname in the Berlin Museum.

Reg. number		A1840,1	A	A4208,1	B	3349,1	3349,2	A1839
Sex		♂	♀	♀	♀	♀	♀	♀
Forearm		40.9	44.3	44.1	45.0	43.0	42.2	43.0
Third digit,	metacarpal	37.5	40	40	40.5	38	37.5	39
	1st phalanx	10	11.5	10	11	11	10	10
	2nd phalanx	20	22	22	22	22	21	22
Fourth digit,	metacarpal	30	33	33.5	33.5	32	31	32.5
	1st phalanx	8	8.5	8.5	9	8.5	8.5	8
	2nd phalanx	10	9	—	9	9	9	9
Fifth digit,	metacarpal	29	31	31	32.5	30.5	30	31
	1st phalanx	10	11	10.5	10.5	10.5	10.5	10
	2nd phalanx	8.5	8.5	8	8.5	8	7.5	8
Tibia		15	15	14	16	15	14.5	15
Hind foot		8	8	8	8	8.5	8.5	9
Calcar		13	15	13	15.5	15	13.5	14
Skull:								
greatest length		15.0	14.5	14.7	15.0	15.0	—	15.4
condylobasal length		13.7	13.8	13.5	13.5	13.7	—	13.9
condyle to front of canine		13.3	13.6	12.9	13.4	13.5	—	13.4
basal length		12.6	12.3	12.1	12.4	12.6	—	12.5
palatal length		6.5	6.1	6.1	6.2	6.0	—	6.3
zygomatic breadth		9.2	9.5	9.2	9.4	9.6	—	9.8
breadth of braincase		6.8	7.4	7.1	7.0	7.1	—	7.5
height of braincase		5.8	5.8	5.7	5.6	5.3	—	5.6
mastoid breadth		7.6	8.0	7.7	7.6	8.0	—	8.0
interorbital constriction		5.7	5.8	5.9	6.2	5.7	—	—
postorbital constriction		3.0	3.0	3.1	3.3	3.1	—	—
width across molars		7.0	7.3	6.8	6.9	6.8	—	7.0
width across cingula canines		3.8	3.8	3.7	3.8	3.7	—	3.9
upper tooth-row, c - m^3		6.0	6.2	5.9	6.1	6.0	—	6.2
lower tooth-row, c - m_3		6.2	—	6.0	6.2	6.2	—	6.3
length of mandible		9.9	—	10.5	10.7	10.5	—	10.7

tronycteris, and *Balantiopteryx*. Cabrera (1958, p. 52) considered *Peronymus* to be a subgenus of *Peropteryx*. In my opinion, however, *Peronymus* occupies a rather isolated position among the Emballonurinae and therefore I regard it as generically distinct from the other genera. A more extensive critical study of the generic characters of the Neotropical bats should finally decide this question.

Centronycteris maximiliani maximiliani (Fischer)

(fig. 2g; pl. IV)

Vesp. (ertilio) calcaratus Schinz, 1821, Das Thierreich, vol. 1, p. 180.

V. (espertilio) Maximiliani Fischer, 1829, Synopsis Mammalium, pp. 112-113 (new name for *Vespertilio calcaratus* Schinz, 1821, which is preoccupied by *V. calcaratus* Rafinesque, 1818).

Type locality. — In the original description by Schinz (1821) given as: "Ostküste von Brasilien". Wied (1826, p. 271) gave a more precise locality: "Diese Fledermaus wurde auf der *Fazenda* zu *Coroaba* am Flüsschen *Jucú*, unweit des *Rio do Espirito Santo* gefunden".

Distribution. — The species occurs from eastern Brazil northward to Mexico. According to Sanborn (1937, p. 337; fig. 42: map of distribution) who accepts the genus as monotypical with two subspecies, the typical subspecies occurs in eastern Brazil, while *C. maximiliani centralis* Thomas, originally described from Panamá, is found in western Brazil, Peru, Ecuador and farther northward; recently this form was reported from Mexico by Dalquest, Frum & Hall (1950). Thomas (1912b, p. 638; 1913a, p. 133) mentioned a specimen from Pará, Lower Amazons, Brazil, so that the occurrence of *Centronycteris* in Suriname is not surprising.

Specimen examined.

Savanna forest, Tibiti; January 18, 1949, Suriname Expedition 1948/1949; RMNH, reg. no. 12111: female, dried skin and skull with damaged rostrum.

Description. — Schinz (1821, p. 180); Wied (1826, vol. 2, pp. 269-271; 1827, pl. 19/20 fig. 4: animal, dorsal view); Temminck (1838, pp. 30-31); Peters (1867, pp. 478-479; 1872, pp. 699-703); Dobson (1878, pp. 376-377: *Saccopteryx calcarata*); Sanborn (1937, pp. 336-337; fig. 42: map of distribution). The original description by Schinz is extremely short; in his 1826 paper Wied gave a more extensive account of this species, while in 1827 he published a coloured plate of the animal.

Length of forearm varying from 42.6 to 44.5 mm; ears somewhat longer than the head, about 11.5 mm long; interfemoral membrane well developed, when stretched reaching about the level of the toes; tail perforating the interfemoral membrane at about its centre, the free end of the tail about 3 mm long; calcar of about the same length as the tibia, the free posterior margin of the interfemoral membrane short; wing membrane from the base of the outer toe; fur rather long and soft, extending on the basal part of the interfemoral membrane, which for the rest is thinly pubescent; short stiff hairs are present on the blackish brown small spots, which are arranged in transverse lines on the interfemoral membrane. In the original description the colour of the fur is given as reddish brown on the dorsal surface, paler on the ventral parts. In the dried Suriname skin, however, the coat colour is more dull greyish brown above and paler beneath; the wings are dark brown.

Dental formula: $\frac{1.1.2.3}{3.1.2.3}$. First upper premolar with distinct anterior and posterior cusps like the larger second upper premolar; basisphenoid divided

by a median septum; sagittal crest indistinct, not extending onto the small postorbital processes of the frontals.

External and skull measurements of the examined Suriname female specimen are given below; in parentheses the external measurements of the type, as given by Peters (1867, p. 479; see for correction of the length of the calcar: 1872, p. 701). Forearm, 42.6 (44.5); length of third metacarpal, 45 (45); first phalanx, 18 (17); second phalanx, 23.5 (28); length of fourth metacarpal, 36 (37.5); first phalanx, 10 (9.4); second phalanx, 11 (11); length of fifth metacarpal, 34 (32.2); first phalanx, 10 (10); second phalanx, 8 (9.3); tibia, 18 (19); hind foot, 7 (7.5); calcar, 18 (18). — Skull: greatest length from canine, 13.9; condyle to front of canine, 12.8; basal length, 11.0; zygomatic breadth, 8.8; breadth of braincase, 6.8; height of braincase, 5.4; mastoid breadth, 7.3; interorbital constriction, 3.2; width across molars, 6.2; upper tooth-row, c-m^3, 5.8; lower tooth-row, c-m_3, 5.7; mandible, 10.0; length of basisphenoid pits, 2.5.

Remarks. — In the dried Suriname skin of the female *Centronycteris* no trace of a wing sac was found. When comparing the measurements of the examined specimen with those given by Sanborn (1937, p. 338) for *C. maximiliani centralis* it appears that the Suriname specimen, which in my opinion belongs to the typical form, in all its dimensions is somewhat smaller. As far as known to me no skull measurements of the typical form have been published before; Thomas (1912b, p. 638) mentioned only that the length of the basisphenoid pits of his Pará specimen were 2.8 mm as against 1.8 mm in the type of *C. centralis*.

According to "Isis" (1828, vol. 21, p. 855) plate 19/20 of Wied's "Abbildungen zur Naturgeschichte Brasiliens" has been published in 1827 and not in 1822 as often stated by authors.

In his important paper on *Centronycteris*, Peters (1872, pp. 700-701) showed that Wied had made a mistake when noting the length of the calcar of the type as about 31 mm; after a close examination of the type, Peters came to the conclusion that actually this length is 18 mm, which corresponds with that of *C. centralis* and also with that of the present Suriname specimen.

Subfamily DICLIDURINAE

The only species of the subfamily Diclidurinae known with certainty from Suriname, *Diclidurus scutatus* Peters, differs from all other Suriname bats in the combination of the following characters: (1) the whitish colour of the long silky fur of the body and of the membranes, (2) the very short thumb, which has a rudimentary claw, and which is almost wholly contained within the wing membrane, and (3) the presence of a cordate pouch in the middle

of the interfemoral membrane; this pouch is separated by a distinct interval from a second pouch, which is much flatter than the anterior one.

The subfamily Diclidurinae includes also the South American genera *Cyttarops* and *Depanycteris,* which are extensively dealt with by Vieira (1942, pp. 254-255).

Diclidurus scutatus Peters

(figs. 5c, 6; pl. IV)

Diclidurus scutatus Peters, 1869, Monatsber. Akad. Wiss. Berlin 1869, pp. 400-401.
? *Diclidurus albus,* Kappler, 1881, Holländisch-Guiana, p. 160.
? *Diclidurus albus,* Thomas, 1903, Ann. Mag. Nat. Hist., ser. 7, vol. 11, p. 378.
Diclidurus spec., Jentink, 1906, Verslag Museum Leiden 1905-1906, p. 15.

Type locality. — In the original description by Peters given as: "Südamerica". I restrict here the type locality to Pará, Lower Amazonas, Brazil, the first exact locality from which a specimen was recorded after the publication of the original description; material from this locality was dealt with by Thomas (1920c, p. 271), who reported upon a specimen "caught in the old town".

Distribution. — The species has been reported from the Amazonas, Brazil, from British Guiana, and now from Suriname.

Specimens examined.

Upper Suriname River; received by the Leiden Museum November, 1905, P. Buitendijk; RMNH, reg. no. 17361: female, preserved in alcohol, skull extracted.

Suriname; date and collector unknown; ZMA, no. 1625: female, preserved in alcohol, skull extracted.

Description. — Peters (1869, pp. 400-401); Thomas (1920c, p. 271); Miller (1907a, pp. 94-95); Goodwin & Greenhall (1961, p. 218; pl. 9 figs. 4-6: skull).

Length of forearm varying from 51 to 57.3 mm; ears, and also the tragus, short and broad; thumb very short, with a rudimentary claw, almost wholly contained within the wing membrane; wing membrane from the ankles; interfemoral membrane well developed, when stretched reaching to behind the ankles; tail about half the length of the interfemoral membrane, the extreme tip ends on the dorsal surface of a cordate pouch, which is separated by a distinct interval from a second pouch, much flatter than the first, the posterior border of this second pouch being about 5 mm from the free margin of the membrane; calcar well developed, somewhat shorter than the tibia. Fur consisting of long silky hairs of an almost white colour, the basal parts of the hairs greyish brown, these greyish brown parts are shorter on the back than on the ventral surface; short hairs of a black colour are placed

around the eyes; the claws of the hind foot are blackish; the wings and the digits are light yellowish.

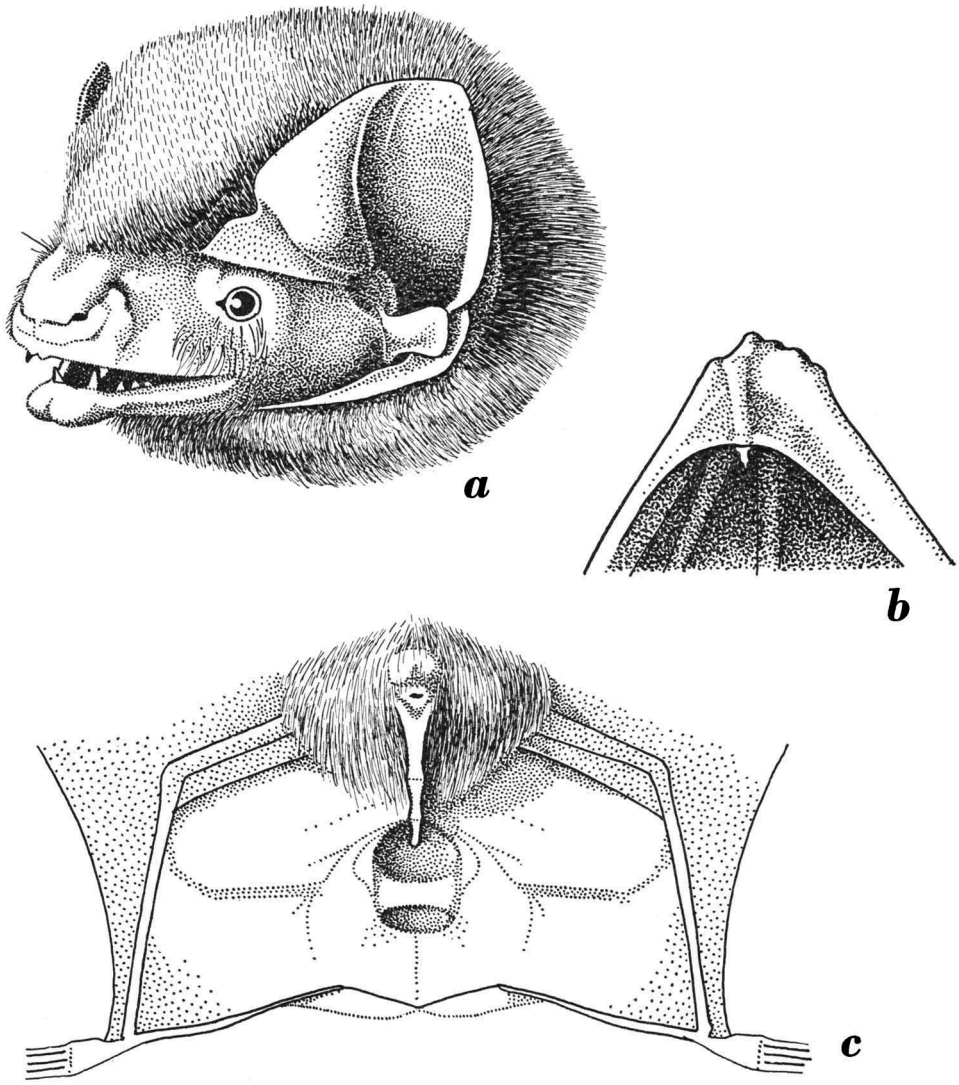

Fig. 6. *Diclidurus scutatus* Peters, RMNH, reg. no. 17361. a, head, front view; b, thumb; c, interfemoral membrane, ventral view.

Dental formula: $\frac{1.1.2.3}{3.1.2.3}$. Upper incisors slender, conical, with a distinct cusp at the outer side of the cingulum, a less pronounced cusp on the inner side at about the middle of the tooth; upper incisors separated from one

another and from the canines; upper canines with a small but distinct cusp at about one-third from the tip; the first upper premolars are very small, in RMNH reg. no. 17361 they touch the canine as well as the second premolar, in ZMA no. 1625 this premolar touches the canine but is separated by a small space from the second premolar; postorbital processes short and blunt. Lower incisors trifid, crowded between the canines; first lower premolar about one-third the size of the second premolar.

The following are external and skull measurements of the two examined Suriname specimens from the Leiden and the Amsterdam Museums, respectively; in parentheses some of the measurements of the type are given as published by Peters in 1869. Forearm, 57.3, 54.5, (51); length of third metacarpal, 55.5, —, (49.5); first phalanx, 10, —, (9); second phalanx, 27, —, (23.4); length of fourth metacarpal, 44, 41, (39); first phalanx, 11, 12, (10.7); second phalanx, 11, 11.5, (9.3); length of fifth metacarpal, 34, 33, (30); first phalanx, 17, 16.5, (16); second phalanx, 6.5, 7.5, (6); ear, length, 14, 13; ear, breadth, 10, 10; tibia, 20.5, 20, (19.5); hind foot, 8.5, 8, (8.8); calcar, 17.5, 16.5, (16.6). — Skull: greatest length, 15.3, 15.5; condyle to front of canine, 14.7, 14.2; basal length, 11.2, 10.6; palatal length, 4.5, 4.1; zygomatic breadth, 10.7, 10.6; breadth of braincase, 8.3, 8.5; height of braincase, 6.9, 7.2; mastoid breadth, 9.3, 9.3; interorbital constriction, 4.3, 4.4; width across molars, 7.2, 7.1; width across cingula canines, 3.9, 3.8; upper tooth-row, c-m^3, 6.6, 6.3; lower tooth-row, c-m_3, 7.3, 7.1; length of mandible, 12.4, 12.1.

Remarks. — The examined Suriname specimens agree very well with the original description by Peters (1869) and with the measurements given by Goodwin & Greenhall (1961, p. 218), the latter being based on a female from British Guiana. In both Suriname specimens two distinct pouches on the interfemoral membrane are present, the anterior much larger and deeper than the posterior, separated by a distinct interval. As far as I can see from the descriptions and the figures of the interfemoral membrane as given by Dobson (1878, pp. 391-392; pl. xx fig. 7a) and by Goodwin & Greenhall (1961, pp. 217-218; fig. 13) for *Diclidurus albus* Wied, the structure of this membrane is a character which can be used to distinguish *D. albus* from *D. scutatus*. Peters's species is smaller than *D. albus*, as is clearly demonstrated by the fact that in the former species the length of the upper tooth-row (c-m^3) is about 6.5 mm, while in the latter it is about 8 mm, and the length of the forearm is about 63 mm. Some authors, however, consider the two species to be conspecific (Vieira, 1942, p. 252; Cabrera, 1958, p. 54); the measurements given by Vieira for his two Rio Negro specimens show them to be *D. scutatus* rather than *D. albus*.

It is possible that also *D. albus* occurs in Suriname. "White bats" from Suriname are dealt with by Lammens (1844, p. 109) and Kappler (1881, p. 160), but without examination of their material it is impossible to say which forms of *Diclidurus* were actually observed by these authors. So Kappler remarked: "Auch Fledermäuse, welche sonst blos in Baumlöchern wohnen, kommen manchmal in die Häuser; so wurde die weisse Fledermaus, *Diclidurus albus,* die sonst blos in hohlen Bäumen lebt, in einem Hause auf St. Laurent gefangen". Also Lammens mentioned the occurrence of "white bats", though their identity was completely unknown to him: "Nicht selten findet man unter den Fledermäusen weisse Stück und sogar blendendweisse". In a letter dated December 8, 1953, to Mr. P. J. van der Feen, at that time curator of mammals of the Zoological Museum at Amsterdam, Mr. D. G. J. Bolten, who from 1902 to 1910 lived in Suriname, wrote: "Ik heb zelf, vrijwel witte vleermuizen, in de volle zon, tegen overhangende bomen, boven de Marowijne (Maronie) bij Albina zien hangen, en bij het voorbijgaan in de corjaal in de zon zien rondvliegen". (I myself have observed practically white bats in full sunlight, suspended from overhanging trees on the Marowijne River near Albina, and saw them flying in the sun when our canoe passed).

Family NOCTILIONIDAE

The two forms of the family Noctilionidae occurring in Suriname can immediately be recognized by (1) the peculiar shape of the truncated muzzle with the upper lip resembling that of a bulldog or of a hare, and with the chin having well developed transverse ridges, (2) the long, narrow, pointed ears, the small tragus of which shows prominent tooth-like processes, (3) the short, brightly coloured fur on the back, which narrows from the shoulders towards the tail, where its breadth is about 10 to 15 mm, (4) the wings, which are attached to the back and not to the sides. Other striking characters are the short tail, which does not exceed half the length of the well-developed interfemoral membrane, and the free tip of which, appearing on the upper surface of the membrane, is 2 to 4 mm long; the remarkably large and strong hind foot, which is about three-fourths the length of the tibia. Like in the families Emballonuridae and Furipteridae there are only two phalanges in the third digit, the proximal phalanx has about three or more times the length of the first phalanx. The length of the forearm is more than 50 mm, while the massive and broad skull, at least in the adult males, has a high sagittal crest.

KEY TO THE SURINAME NOCTILIONIDAE

1. Length of forearm more than 70 mm; combined length of the tibia and hind foot more than 70 per cent of the length of the forearm . *Noctilio leporinus leporinus*, p. 65
— Length of forearm less than 70 mm; combined length of the tibia and hind foot less than 70 per cent of the length of the forearm . . *Noctilio labialis albiventris*, p. 63

Noctilio labialis albiventris Desmarest

(figs. 2h, 8b; pl. V)

Noctilio albiventris Desmarest, 1818, Nouveau Dict. Hist. Nat., nouvelle éd., vol. 23, pp. 15-16.

Noctilio albiventer, Peters, 1865, Monatsber. Akad. Wiss. Berlin 1865, p. 571.

Type locality. — Not given in the original 1818 description, but in a later publication Desmarest (1820, p. 118) stated: "Patrie. Inconnue, mais très-vraisemblablement l'Amérique méridionale". Restricted by Cabrera (1958, p. 56) to Rio São Francisco, Bahia, Brazil, the first exact locality whence the species was reported, viz., by Spix (1823, p. 58).

Distribution. — The species inhabits northern South America and southern Central America; its range extends from northern Argentina and Peru to Nicaragua. Three subspecies are currently recognized. *Noctilio labialis albiventris* is the eastern form inhabiting the area from northern Argentina through Brazil to the Guianas; *N. labialis zaparo* Cabrera, the southwestern race, is found in Peru, Colombia, and Ecuador, while the area of the typical form, *N. labialis labialis* (Kerr), occupies the northwestern part of the range of the species (northern Colombia, Venezuela, and Central America). Hershkovitz (1949, pp. 433-434) was of the opinion that *N. labialis zaparo* is the typical subspecies, while he used the name *N. labialis minor* Osgood for the northwestern subspecies. As has been clearly shown by Cabrera (1958, p. 55) the type locality of *N. labialis labialis* (Kerr) is the Mosquito coast, Nicaragua, and not Peru, as suggested by Hershkovitz.

Specimen examined.

Paramaribo, highway to Uitkijk at Vijfde Rijweg; April 23, 1961, D. C. Geijskes; RMNH, reg. no. 17296: female, dried skin and skull.

Description. — Spix (1823, p. 58; pl. xxxv figs. 2 and 3: animal, ventral and dorsal view, coloured); Peters (1865c, pp. 570-573; pl. opposite p. 588 fig. 2: skull); Dobson (1878, pp. 398-399); Miller (1907a, p. 99: genus *Dirias*); Vieira (1942, pp. 262-265).

Length of forearm varying from (54) 60 to 68.7 mm; ears large, narrow and pointed; tragus small, with prominent tooth-like processes; chin with raised cutaneous ridges; interfemoral membrane large, when stretched expanding slightly behind the toes; tail short, perforating the basal third of

the membrane and appearing on its dorsal surface; calcar long, about 1.5 times the length of the tibia, the free margin of the interfemoral membrane very short; wing membrane from the distal third of the tibia; combined length of the tibia and hind foot less than 70 per cent the length of the forearm. Fur very short above and beneath, narrowing on the back from behind the shoulders to the tail where its breadth is about 15 mm; colour greatly varying, above as well as beneath, from greyish brown to reddish brown dorsally, and from whitish to grey and yellowish to dark orange ventrally; on the back a whitish median streak from interscapular region to the tail, this streak often indistinct or absent; membranes blackish.

Dental formula: $\frac{2.1.1.3}{1.1.2.3}$. Upper inner incisors close together, in contact at about the middle, the distal part of their inner margins diverging. Upper outer incisors strikingly smaller than the inner, placed somewhat behind the inner and in contact with them, but distinctly separated from the canines; upper premolar, about as high as the molars, but about half as long, crowded between canine and first molar. Lower incisors crowded between the canines, with broad, bifid crowns, reaching to the inner margin of the cingulum of the canines; first lower premolar crowded out of the tooth-row to the inside, so that the second premolar and the canine are almost in contact with each other; base of first premolar about half as long as that of the second, the latter tooth being about as high as the molars.

External and skull measurements of the examined female Suriname specimen. Forearm, 64.9; length of third metacarpal, 57; first phalanx, 13.5; second phalanx, 55; length of fourth metacarpal, 58.5; first phalanx, 9; second phalanx, 28; length of fifth metacarpal, 53.5; first phalanx, 10.5; second phalanx, 5; length of ear, 20.5; tibia, 20; hind foot, 16; depth of interfemoral membrane from anus, about 38; calcar, 30; tail, 15.5; free end of tail, 2.5. — Skull: greatest length, 21.2; condylobasal length, 19.6; condyle to front of canine, 18.4; basal length, 17.1; palatal length, 9.8; zygomatic breadth, 15.8; breadth of braincase, 11.7; height of braincase, without crest, 8.6; mastoid breadth, 14.0; interorbital constriction, 5.8; width across molars, 10.1; width across cingula canines, 6.9; upper tooth-row, c-m^3, 7.9; lower tooth-row, c-m_3, 8.4; length of mandible, 14.2.

Remarks. — In the examined Suriname specimen of *Noctilio labialis albiventris* the dorsal surface is reddish brown; the longitudinal median line is a shade lighter, extending from the interscapular region to the tail; the ventral surface is orange yellowish, more yellowish on the throat. The skull shows all essential characters mentioned by Miller (1907a, p. 99) for his genus *Dirias*.

The present species was reported for the first time from Suriname by Peters (1865c, p. 571), who examined a specimen from Paramaribo, which he compared with the two specimens collected by Spix in Brazil. Peters noted that the Paramaribo specimen agrees in colour with Spix's material. Judging by the coloured figure published by Spix (1823, pl. xxxv figs. 2 and 3) Peters's Suriname specimen has a whitish ventral surface with some patches of a light orange tinge, while the dorsal surface is greyish brown. This shows that also the individual variation in colour in the Suriname population of the present species is considerable, like that in the whole range of the species.

A collector's note accompanying the examined Suriname specimen states that it was killed when it flew against the window of a car at 7 p.m. According to Dunn (1934) the present species inhabits not only attics of buildings, "but may also roost in hollow trees or some other natural situations". As to the food of the species, Bloedel (1955, pp. 398-399) came to the conclusion that *Noctilio labialis,* which is not known to eat fish like *N. leporinus,* "starves rather than learning to catch fish in captivity under identical conditions to those under which *Noctilio leporinus* easily learned to fish".

Miller (1906a, p. 84; 1907a, p. 99) considered the differences between *Noctilio leporinus* and *N. albiventris* of generic importance and created for the latter species his new genus *Dirias.* Some authors followed Miller, e.g., Thomas (1920c, pp. 272-273), and Vieira (1942, p. 262), but others, e.g., Osgood (1910, pp. 31-32), Hershkovitz (1949, p. 433), and Cabrera (1958, pp. 54-57) discarded even the subgeneric status of *Dirias.* As far as I can see the only striking difference between *Noctilio* and *Dirias* is the relative shortness of the tibia and hind foot of *N. albiventris,* a character which is generally considered to be of specific significance only. According to Osgood the characters of the teeth dealt with by Miller to separate the two genera are subject to great variation.

There is no good reason to emend the original 1818 spelling *albiventris* to *albiventer,* as was done by Desmarest (1820) and by many subsequent authors.

Noctilio leporinus leporinus (Linnaeus)

(figs. 1e, 5d, 7, 8a; pl. V)

Vespertilio leporinus Linnaeus, 1758, Systema naturae, ed. 10, vol. 1, p. 32.

Vespertilio Minor Fermin, 1765, Histoire naturelle Hollande équinoxiale, p. 9.

"Chauves-Souris ... le museau d'un lievre", Fermin, 1769, Description de la Colonie de Surinam, vol. 2, p. 139.

"Vleder-Muisen ... den snuit van een' haas", Fermin, 1770, Beschryving van de Colonie van Suriname, vol. 2, p. 120.

"Vledermuizen ... tweede soort", Hartsinck, 1770, Beschryving van Guiana, vol. 1, p. 98.
"[Vleermuis] Met den Hazemond", Teenstra, 1835, Landbouw in Suriname, vol. 2, p. 406.
Vespertilio leporinus, Lammens, 1844, Isis 1844, p. 109.
Noctilis dorsatus, Kappler, 1881, Holländisch-Guiana, p. 163.
Noctilio leporinus, Jentink, 1887, Mus. Hist. Nat. Pays-Bas, vol. 9, p. 287; 1888, vol. 12, p. 199.
Noctilio mastivus, Jentink, 1888, Mus. Hist. Nat. Pays-Bas, vol. 12, p. 199 (non *Noctilio mastivus* Vahl).
Noctilio leporinus leporinus, Goodwin, 1928, Journ. Mammalogy, vol. 9, p. 111 table 1.

Type locality. — "America". Restricted by Thomas (1911a, p. 131) to Suriname.

Distribution. — *Noctilio leporinus* has a wide range of distribution extending from northeastern Argentina, Paraguay, and southeastern Brazil northwards to southern Mexico, the Lesser and Greater Antilles. The systematic significance of the four recognized subspecies of the present species needs further investigation. The typical form occurs in Brazil north of the Matto Grosso and Minas Geraes, in Peru, Colombia, the Guianas, Venezuela, Curaçao, Trinidad, Tobago, and on the Lesser Antilles; *N. leporinus rufipes* D'Orbigny is found in eastern Bolivia, Paraguay, northeastern Argentina and southeastern Brazil; *N. leporinus mexicanus* Goldman inhabits Central America, from Panama to southern Mexico, while *N. leporinus mastivus* (Vahl) has been reported from the Virgin Islands, Cuba, Mono Island, and Puerto Rico.

Specimens examined.

Paramaribo; 1888, J. H. Spitzly; RMNH, reg. no. 13502: female, preserved in alcohol, skull extracted (= Jentink's 1888 *N. mastivus,* no. a).

Paramaribo; January 29, 1952, D. C. Geijskes; RMNH, reg. nos. 12002 and 12003: females, dried skins and skulls.

Karel François, Saramacca River, about 80 km west of Paramaribo; March 5, 1959, J. Belle; RMNH, reg. no. 13489: male, preserved in alcohol, damaged skull inside.

Kampongbaroe, near Paramaribo; April 7, 1961, D. C. Geijskes; RMNH, reg. no. 17360: female, preserved in alcohol, skull extracted.

Suriname; 1860, W. J. Bresser; RMNH, reg. no. 13490: male, preserved in alcohol, skull extracted (= Jentink's 1888 *N. leporinus,* no. e).

Suriname; June 9, 1910, D. G. J. Bolten; RMNH, reg. no. 13503: male, preserved in alcohol, skull extracted.

Suriname; 1843, A. Kappler; SMN, Nr. 238, 1 and 2: female and male, preserved in alcohol, skulls extracted.

Suriname; date and collector unknown; ZMA, no. 1643a and d: females, preserved in alcohol, skulls extracted; no. 1643b and c: males, preserved in alcohol, skulls extracted.

Suriname; date and collector unknown; RMNH, reg. no. 17375a and b: skeletons (= Jentink's 1887 *N. leporinus,* nos. a and b).

Suriname; date and collector unknown; RMNH, reg. no. 17376a and b: mounted specimens in poor condition, skulls inside (= Jentink's 1888 *N. leporinus,* nos. a and b).

Description. — Dobson (1878, pp. 393-396; 399: table); Miller (1907a,

pp. 95-99; pl. xiii: shoulder girdle, pelvis, and leg bones); Vieira (1942, pp. 257-261; fig. 6: animal, ventral view); Husson (1960, pp. 59-61; fig. 10: head, left side view; pl. 13: skull); Goodwin & Greenhall (1961, pp. 218-221; fig. 15: foot; fig. 16: head, front view; pl. 10 figs. 1-3: skull).

Length of forearm varying from 77 to 85 mm; ears large, narrow and pointed, about 24 mm long and 10 mm broad; tragus small, with prominent tooth-like processes; chin with raised transverse cutaneous ridges; interfemoral membrane well-developed, when stretched expanding behind the ankles; tail short, not exceeding half the length of the interfemoral membrane, perforating it and appearing for about 4 mm on its dorsal surface; calcar distinctly longer than the tibia, the free margin of the interfemoral membrane short, at most half as long as the calcar; wing membrane from the distal third of the tibia and from the back; combined length of the tibia and hind foot more than 70 per cent of the length of the forearm. Fur very short, above and beneath, narrowing on the back from behind the shoulders to the tail where its breadth is about 10 to 15 mm; colour greatly varying, above as well as beneath, from dark to reddish brown dorsally, and from yellowish to bright reddish orange ventrally; an indistinct whitish median dorsal streak extends from the shoulders to the tail, but may be absent; membranes blackish or dark brown, the ventral surface of the interfemoral membrane is much lighter than its dorsal surface, being often yellowish.

Dentition: $\frac{2.1.1.3}{1.1.2.3}$. Teeth essentially like in *Noctilio labialis*, the most striking difference, at least in the examined specimens from Suriname, is that in *N. leporinus* the upper molars are separated postero-internally by wide spaces, while in the one examined specimen of *N. labialis* the molars touch each other nearly over their full breadth. Sagittal crest sharply defined; in adult males it is better developed than in adult females, in the former to about 2.5 mm high.

The external and skull measurements of eleven Suriname specimens are given in Table VI.

Remarks. — Linnaeus (1758, p. 32) based his *Vespertilio leporinus* on Seba's (1734, vol. 1, pp. 89-90; pl. lv fig. 1; see fig. 7 in the present paper) description and plate of "Vespertilio, Cato similis, Americanus". Seba's French description runs as follows: "No. 1. Chauve-Souris d'Amerique, Mâle, semblable à un petit Chat. Elle a la tête ronde, comme celle du Chat, la bouche large ressemblante au museau du Lievre, le menton pendant, les dents pointuës, les narines rondes, les oreilles grandes, le poil roux-clair. On nous l'a envoyé d'Amérique; c'est un mâle qui a la tête & le corps de la figure d'un jeune chat. Ses pieds de devant que couvrent ses aîles sont

TABLE VI

External and skull measurements of eleven specimens of *Noctilio leporinus leporinus* (L.) from Suriname.

Museum	RMNH	ZMA	ZMA	SMN	RMNH	ZMA	RMNH	ZMA	RMNH	SMN	RMNH
Reg. number	13503	1643c	1643b	238,2	13490	1643d	17368	1643a	12003	238,1	12002
Sex	♂	♂	♂	♂	♂	♀	♀	♀	♀	♀	♀
Forearm	77.3	78.8	77.7	80.0	81.2	79.3	82.1	78.5	80.0	80.0	78.8
Third digit, metacarpal	73	74	74.5	75	75.5	72	75	74	75	74	72
1st phalanx	19	20	18	20	20	20	20.5	20	18	20	18
2nd phalanx	64	68	68	67	68	65	68	66	65	65	63
Fourth digit, metacarpal	73.5	75.5	74.5	76	76.5	73.5	76	75.5	74	75	73.5
1st phalanx	13.5	13	14	13	13	14	12.5	13	12	13	11.5
2nd phalanx	35	34	35	35	35	34	35	35	31	37	32
Fifth digit, metacarpal	71	72.5	71.5	73	73	69.5	73	72.5	72	72	70
1st phalanx	16.5	15	16	16	16	16	16	16	15	16	14.5
2nd phalanx	8	8	8	8	8	8	8	8	8	9	8
Ear, length × breadth	24 × 10.5	24 × 10.5	24 × —	24 × —	24 × 9.5	—	24 × 9	—	—	24 × —	—
Tibia	36	36	36	37	36	37	35	34	36	35	36
Hind foot, with claws	27	28	28	26	28	27	26	25	26	27	26
Calcar	40	40	37	45	38	40	40	39	—	40	—
Skull:											
greatest length	23.3	24.5	24.7	26.1	26.2	—	24.1	24.4	24.6	24.7	24.9
condylobasal length	22.8	23.5	23.0	23.5	23.7	22.0	22.7	22.4	22.6	23.2	22.8
condyle to front of canine	21.9	22.3	22.3	22.4	22.5	20.7	21.3	21.5	21.4	22.2	21.7
basal length	20.1	20.4	20.1	21.0	20.9	19.3	19.5	19.5	20.3	20.4	20.4
palatal length	11.7	12.4	12.4	12.8	12.6	11.2	12.1	12.3	12.5	12.4	12.6
zygomatic breadth	17.0	18.3	19.1	19.0	18.5	16.8	17.8	18.0	18.3	17.6	18.3
breadth of braincase	12.7	13.4	13.9	13.5	13.5	13.0	13.5	13.5	13.5	13.4	13.4
height of braincase, without crest	9.7	9.7	10.3	10.2	10.2	9.9	9.8	9.8	10.3	10.4	10.4
with crest	10.0	10.7	11.3	12.5	12.5	10.1	10.5	11.0	11.0	11.3	11.6
mastoid breadth	14.9	—	—	17.0	18.4	—	15.3	15.9	16.0	15.1	16.0
interorbital constriction	6.9	6.8	6.8	7.0	7.2	6.7	6.5	6.6	6.8	6.7	6.6
width across molars	11.9	11.9	12.5	—	12.3	—	11.8	11.7	12.0	12.2	12.1
width across cingula canines	8.5	8.4	8.5	9.3	9.5	8.0	8.3	8.1	7.8	8.2	8.2
upper tooth-row, c - m^3	10.3	10.3	10.5	10.4	10.5	9.9	9.9	10.0	10.0	10.2	10.1
lower tooth-row, c - m_3	10.9	10.9	11.1	10.9	11.3	10.6	10.5	10.5	10.5	10.8	10.5
length of mandible	17.4	17.6	17.8	18.0	18.3	17.1	17.3	17.0	17.6	17.5	17.3

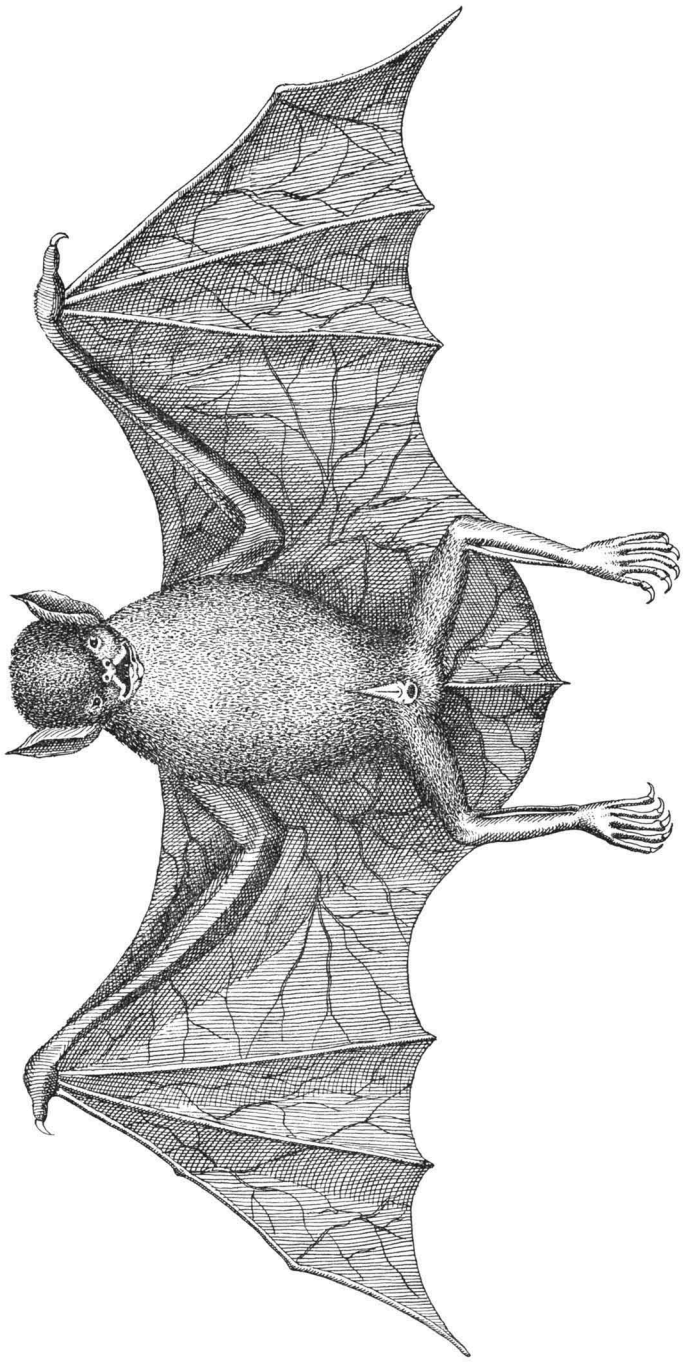

Fig. 7. Vespertilio, Cato similis, Americanus [= *Noctilio leporinus leporinus* (L.)]. After Seba, 1734, pl. lv fig. 1. 2/3 × original size.

assez longs, & ont chacun un pouce, & trois doigts composés de trois articulations qui servent de secours aux aîles. Le pouce est muni d'un ongle pointu & recourbé, au moyen duquel cet animal se crampone. Sa queuë est accruë aux aîles, ce qui facilite son vol. Les pieds de derriere sont fendus en deux, car les deux os exterieur & interieur, dont l'articulation commence à la cuisse & va jusqu'au talon, s'éloignent l'un de l'autre sans qu'il y ait rien entre eux, & chacun de ses deux os est couvert d'un poil différent. Les pieds de derriere ont cinq doigts armés d'ongles aigus & crochus". Seba's description and figure leave not the least doubt that he had the present species before him.

The length of the forearm of the six examined males of *N. leporinus*

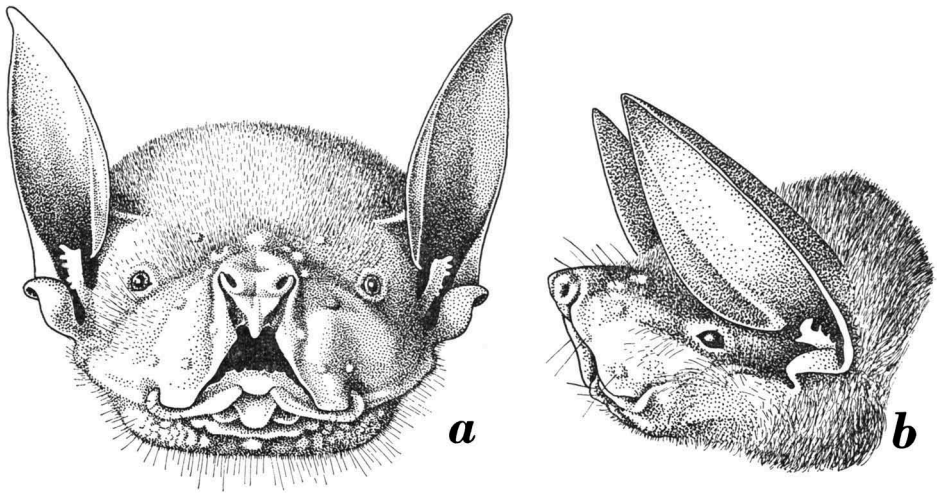

Fig. 8. a, *Noctilio leporinus leporinus* (L.), RMNH, reg. no. 13503; b, *Noctilio labialis albiventris* Desmarest, RMNH, reg. no. 17271.

from Suriname varies from 77.3 to 83.0 mm. Dalquest (1951, p. 28) found that in four males from Trinidad, W.I., this dimension ranges from 83.4 to 89.5 mm. Also the skull measurements given by Dalquest and by Goodwin & Greenhall (1961, p. 219) for the Trinidad *N. leporinus* show that on an average the specimens of this island are evidently larger than those of Suriname. The material known from both localities is too small, however, to decide the question whether or not the Trinidad form of *Noctilio leporinus* represents a subspecies distinct from *N. leporinus leporinus*. The above authors assign the Trinidad animals to the typical subspecies.

As to sexual differences in *Noctilio leporinus,* Hensel (1872, pp. 22-23)

pointed out that a dimorphism occurs in the skull of the species, while G. M. Allen (1937) showed it to be present in the coat colour. According to Hensel striking differences between males and females are found (1) in the length of the upper canine, (2) in the width across the tips of the upper canines, and (3) in the height of the sagittal crest; in all these respects the males are distinctly larger than the females. In the examined male and female specimens of *N. leporinus* from Suriname the width across the cingula of the canines was measured and compared by me; this width varies in the six females from 7.8 to 8.3 mm, and in the five males from 8.4 to 9.5 mm. The difference between these ranges is the more striking since the length of the forearm in the examined males is even somewhat less than in the females.

After examination of a rather large series of *N. leporinus* from Panama and Brazil, G. M. Allen (1937) came to the conclusion that all adult males "are deep rufous above, brighter orange rufous below, while all of the females were paler and lacked the rufous tints altogether, being olive brown above, paling into clearer yellowish or yellowish buff below". Unfortunately the greater part of the examined Suriname specimens are too bleached by spirit conservation to permit of an accurate evaluation of the colour variation. Nevertheless the condition of the material is such that Allen's conclusion proves not to hold entirely for the Suriname material. The unbleached male specimen of Karel François (RMNH, reg. no. 13489) is of the same colour as the unbleached female from Kampongbaroe (RMNH, reg. no. 17368). Both specimens have the ventral surface distinctly bright orange rufous, while the dorsal surface is dark reddish brown; the female shows no trace of a yellowish tinge on its ventral surface. Taking furthermore into account that Goodwin & Greenhall (1961, p. 220) found a similar variation of the coat colour in a population of the present species from Trinidad, it is evident that in this species the coat colour as such is not a reliable character for distinguishing males from females. Further observations are necessary to decide whether or not the rufous tinge of the ventral surface is found more frequently in males than in females.

The whitish or light yellowish dorsal median streak from the neck to the base of the tail is subject to great variation as to its breadth and intensity; in the Suriname specimens this line is very narrow and sometimes even absent.

Occurrence in Suriname. — As far as known to me Fermin (1765, p. 9) was the first author who mentioned the occurrence of the present species in Suriname, giving it the scientific name *Vespertilio Minor*. After having given a description of *Vespertilio Cynocephalus* [= *Vampyrum spectrum*] Fermin noted: "Il y a encore une autre espece de chauve-souris Domestique,

qui est de la moitié plus petite que la précédente. Elle a la tête toute ronde & le museau d'un lièvre. *Vespertilio Minor*". In a later publication Fermin (1769, vol. 2, p. 139) used the same words for the present species only omitting the latin name (see also the Dutch translation, 1770, vol. 2, p. 120). There can be no doubt that the present species is meant by Fermin, the words "le museau d'un lièvre" denoting one of its characteristic features.

Also Hartsinck (1770, vol. 1, p. 98) dealt with *N. leporinus*; after mentioning *Vampyrum spectrum* he stated: "Daar is nog een tweede soort de helft kleiner dan de voorgaande, rond van Kop, en de Snoet als die van een Haas". (There is still a second species half the size of the first mentioned, with rounded head, and with a muzzle like that of a hare). Without giving any further information Teenstra (1835, vol. 2, p. 406) listed *N. leporinus* in his table of Suriname bats under the name "Met den Hazemond" (with the hare's mouth). Lammens (1844, p. 109) gave the following description: "Nr. 359. Die Fledermaus mit der Hasenscharte, Zimmermann p. 492; *Vespertilio leporinus* Linne. Hat Zimmermann gut beschrieben. Die Länge ist 4″, Flugweite 22, Schwanz 1½. Färbung oben bräunlichgrau; die Ohren behaart und spitzig, mit kleinen Deckeln; die Nase aufgeworfen und zugespitzt; die Oberlippe hängend; Warzen auf Nase und Lippen. Sie bewohnt Bäume und stinkt sehr übel".

In the subsequent literature seen by me I did not find new data on the occurrence of *Noctilio leporinus* in Suriname; in his several publications Kappler paid no special attention to the species though he mentioned it in his 1881 (p. 163) list of Suriname mammals.

Biology. — The fish-eating habits of the present species are well known (Benedict, 1926; Goodwin, 1928; Gudger, 1945; Bloedel, 1955). According to Gudger (1945, p. 14) these bats "probably learned to fish by accidentally catching fish at the surface of the water when seeking aquatic insects. Finding fishes probably more palatable than insects, they tried again and again". This explains why the stomach contents of these bats usually consist of insects as well as fragments of fish. Goodwin (1928, p. 111 table I) deals with a specimen from Suriname which after examination of the stomach showed to have: "Remains of many ants (*Solenopsis* sp.), winged. Fragments of a beetle (probably Crysomelidae), of a mole-cricket (*Gryllotalpa* sp.), of a fly (Sapromyzidae), and of a fish-trace".

A collector's note accompaning the specimen from Karel François, stated that it was killed when it flew against a car on the road in an area with mangroves and sandy elevations.

The unpleasant smell of *Noctilio leporinus,* which was mentioned by Lammens (1844), is also referred to in several other early publications. So Spix

(1823, p. 58) noted: "Dormitat diu gregatim in arboribus excavatis odore urinoso praemolestes", while Wied (1826, vol. 2, p. 223) remarked: "Sie hat einen unangenehm honigartig süsslichen Geruch".

Family PHYLLOSTOMIDAE

With the exception of the species of the subfamily Chilonycterinae all Suriname Phyllostomidae can immediately be recognized (1) by the presence of a distinct nose leaf of which the vertical, free portion is lancet-shaped, and (2) by the lower lip, which is provided with small wart-like outgrowths arranged in a more or less semicircular manner. In the genus *Chilonycteris* (Chilonycterinae) there is no distinct nose leaf, and the lower lip shows plate-like outgrowths with numerous small rounded papillae (fig. 13a).

All species of the Suriname Phyllostomidae have the third digit with three phalanges, while in the skull the premaxillaries are fused with each other as well as with the maxillaries, so that the upper incisors are not separated by an anterior palatal emargination (fig. 16).

The above mentioned characters are characteristic for the family as a whole. The most important characters for the distinction of the species within the group are the following: (1) the development of the interfemoral membrane, (2) that of the tail and the calcaneum, (3) the attachment of the wing membranes, and (4) the structure of the teeth. To the Phyllostomidae belong both the smallest and the largest of the Suriname bats, namely *Ametrida minor,* of which the length of the forearm is about 25 mm, and *Vampyrum spectrum,* of which this length is about 105 mm. The Suriname Phyllostomidae belong to six subfamilies, the main characters of which are given in the following key.

KEY TO THE SUBFAMILIES OF THE SURINAME PHYLLOSTOMIDAE

1. Nose leaf absent, lower lip with plate-like outgrowths bearing numerous small rounded papillae (fig. 13a) . . . . . Chilonycterinae, p. 74
— Nose leaf present, with a distinct free vertical portion 2
2. Tongue very long (fig. 20); upper surface of lower lip in the centre divided by a deep groove (fig. 24b); head long and narrow; cusps and commissures of upper molars so reduced that the W-pattern is absent . . . . . Glossophaginae, p. 126
— Tongue normal; upper surface of lower lip not divided by a deep groove . . . 3
3. Interfemoral membrane reduced to a very narrow band along the legs and the posterior part of the body (fig. 1h), covered with fine long fur; calcar indistinct (or absent); crown of molars with a distinct longitudinal groove (pl. XVI) . . Sturnirinae, p. 153
— Interfemoral membrane moderately to largely developed; calcar distinct; tail present or absent 4
4. External tail absent or hardly visible 5
— Tail distinct 8

5. Muzzle long and narrow (fig. 14a); length of forearm more than 70 mm . . . . . Phyllostominae (genera *Vampyrum* and *Chrotopterus*), p. 78
— Muzzle short and broad 6
6. Length of forearm more than 40 mm . . . . . Stenodermatinae, p. 157
— Length of forearm less than 40 mm 7
7. Lower lip with a central wart flanked on each side by a larger elongate wart (fig. 23b); length of forearm varying from about 30 to 35 mm . . . . . Carolliinae (genus *Rhinophylla*), p. 152
— Lower lip with a central wart surrounded by a row of small warts . . . . . Stenodermatinae, p. 157
8. Calcar shorter than the foot; length of forearm varying from 40 to 45 mm; zygomatic arches incomplete . . . . . Carolliinae (genus *Carollia*), p. 144
— Calcar equal to or longer than the foot, if shorter (except *Vampyrum* and *Chrotopterus*) the length of forearm more than 50 mm . . . . . Phyllostominae, p. 78

Subfamily CHILONYCTERINAE

The species of the subfamily Chilonycterinae differ from all other Phyllostomidae by the presence of plate-like outgrowths on the lower lip and by the absence of a distinct nose leaf. In the only species of this group known at present from Suriname, *Chilonycteris rubiginosa* Wagner, the lower lip is much expanded and folded outward, with numerous rounded small papillae. Perhaps also the genus *Pteronotus* occurs in Suriname; this genus has a wide distribution in northern South America north of the Matto Grosso. The two known species of *Pteronotus* can immediately be recognized by the attachment of the wings to the median line of the dorsal surface of the body instead of to the sides of the body; in this manner the wings cover the fur so that the upper part of the body appears to be naked below the shoulders.

Chilonycteris rubiginosa rubiginosa Wagner

(figs. 1f, 13a, 16b; pl. XVI)

Chilonycteris rubiginosa Wagner, 1843, Arch. Naturgesch., vol. 9, pt. 1, p. 367.

Type locality. — "Caiçara, Mato Grosso, Brazil".

Distribution. — The species has a wide range of distribution on the mainland of South and Central America, from the Matto Grosso, Brazil, to its northern limit in Mexico.

Specimen examined.

Tafelberg, Anton van Aerde Cave; April 2, 1958, D. C. Geijskes; RMNH, reg. no. 16420: adult female, preserved in alcohol, skull extracted.

Description. — Wagner (1847, pp. 181-183; pl. iii fig. 2: animal, ventral view; figs. 3-6: skull); Dobson (1878, pp. 452-453; pl. xxiii fig. 3: head, front view); Rehn (1904, pp. 200-203); Miller (1907a, pp. 119-120); Felten (1956a, pp. 69-73; pl. 7 fig. 1: skull); Goodwin & Greenhall (1961, pp.

222-223; fig. 18: head, front view; fig. 19: muzzle, front view; pl. 10 figs. 4-6: skull).

Length of forearm varying from 59 to 64 mm; nose leaf absent; lower lip covered with prominent, wart-like papillae; ears, abruptly attenuated above, about 20 mm in length; tragus about one-third of ear-length; length of the first phalanx of the third finger about one-fifth the length of the third metacarpal; interfemoral membrane well developed, reaching about the bases of the toes; calcar about as long as the tibia; tail perforating the interfemoral membrane, and projecting for about half its length on the dorsal surface; wing membrane from the inner side of the lower third of the tibia and from the calcar. Two colour phases occur: the one bright reddish brown, the other more greyish, the ventral surface always somewhat lighter than the dorsal.

Dental formula: $\frac{2.1.2.3}{2.1.3.3}$. The upper incisors completely fill the space between the canines; the middle incisors, much larger than the outer, are bifid: the first upper premolar, much smaller than the second, stands perfectly in the tooth-row. The lower incisors are about equal in size, their cutting edges are trifid; the first and the third lower premolars are of about equal size; the first premolar is in contact with the canine as well as with the third premolar, while the small middle premolar is crowded out of the tooth-row on the lingual side.

External and skull measurements of the examined Suriname female specimen. Forearm, 63.3; length of third metacarpal, 55; first phalanx, 11; second phalanx, 17.5; length of fourth metacarpal, 52.5; first phalanx, 12; second phalanx, 15; length of fifth metacarpal, 51.5; first phalanx, 12; second phalanx, 14; length of ear, 20; tibia, 25; hind foot, 12.5; calcar, 25. — Skull: greatest length, 22.1; condylobasal length, 21.1; condyle to front of canine, 20.5; basal length, 19.7; palatal length, 10.9; zygomatic breadth, 12.6; breadth of braincase, 10.7; height of braincase, 8.9; mastoid breadth, 11.8; interorbital constriction, 4.6; width across molars, 8.3; width across cingula canines, 6.2; upper tooth-row, c-m^3, 9.5; lower tooth-row, c-m_3, 10.2; length of mandible, 16.1.

Remarks. — Until recently taxonomists agreed that the mainland form *Chilonycteris rubiginosa* could be separated as a distinct species from the West Indian island form *Ch. parnellii,* originally described from Jamaica as *Phylloda parnellii* by Gray (see Koopman, 1955, p. 112; Hall & Kelson, 1959, pp. 92-93; map 56). Koopman (1955, p. 111; 1959, p. 4) stated, however, that *Ch. rubiginosa* and *Ch. parnellii* are "almost certainly conspecific"; this statement would be more acceptable if Koopman had added arguments in support of his opinion. According to Goodwin & Greenhall (1961, p. 223)

there are "positive cranial characters" by which "forms of the West Indian *parnellii* group can always be separated from the mainland *rubiginosa* forms". Pending a more definite settlement of this problem I use here the name *Ch. rubiginosa* for the Suriname specimen at hand.

If Koopman's taxonomic views are correct, an interesting nomenclatorial question arises. The question which of the specific names *parnellii* or *rubiginosa* has priority over the other becomes difficult because both were proposed in 1843. De la Torre (1955, p. 696) is correct in that the date of publication of *Phylloda parnellii* is not April, but October 1843; as the date of publication of *Ch. rubiginosa,* which is known to be 1843, cannot be further precised, one has to accept, according to the 1961 Code (Article 21, b, ii; p. 19), as the date of publication December 31, 1843. As the date for *Phylloda parnellii* is October 1843, it has priority over *Ch. rubiginosa.* This shows that Koopman is right in using the specific name *parnellii* for the species, though his argument using "the law of the first reviser" does not hold, as such a law does not apply to the present situation. De la Torre's (1955, p. 696) and Felten's (1956a, p. 72) proposal to retain the "better known and more widely used name "*rubiginosa*" for the species is indeed a worth while suggestion, which might be submitted to the International Commission on Zoological Nomenclature.

The examined Suriname specimen of *Chilonycteris* has the hairs of the upper parts uniformly bright reddish brown with a golden tinge; the hairs of the under parts are darker brown without a golden tinge, while their tips are somewhat lighter. The length of the forearm of this specimen is 63.3 mm, it thus belongs to the typical *Ch. rubiginosa.* The coat colour as well as the dimensions of the Suriname specimen agree very well with those given by J. A. Allen (1911, pp. 261-263) for specimens from El Callao, eastern Venezuela south of the Orinoco, which Allen considered to belong to *Ch. rubiginosa.* Felten (1956a, p. 72) found that in 60 males and 70 females of *Ch. rubiginosa fusca* from El Salvador the length of the forearm varies from 56 to 62 mm; the Suriname female specimen exceeds therefore the maximum length of the form from El Salvador. The systematic status and distribution of *Ch. rubiginosa fusca* J. A. Allen (1911, pp. 262-263) and *Ch. r. rubiginosa* is not yet fully clear. The data given by Rehn (1904, pp. 200-204), J. A. Allen (1911, p. 263), Miller (1912a, p. 23), Hershkovitz (1949, pp. 434-435), and Felten (1956a, p. 72) certainly do support Felten's words: "Ich möchte vermuten, dass bei Vorliegen umfangreicherer Serien aus dem gesamten Verbreitungsgebiet eine kontinuierliche Abnahme der Masse von Süden nach Norden ohne besonders hervortretende Grenzzonen festzustellen sein wird".

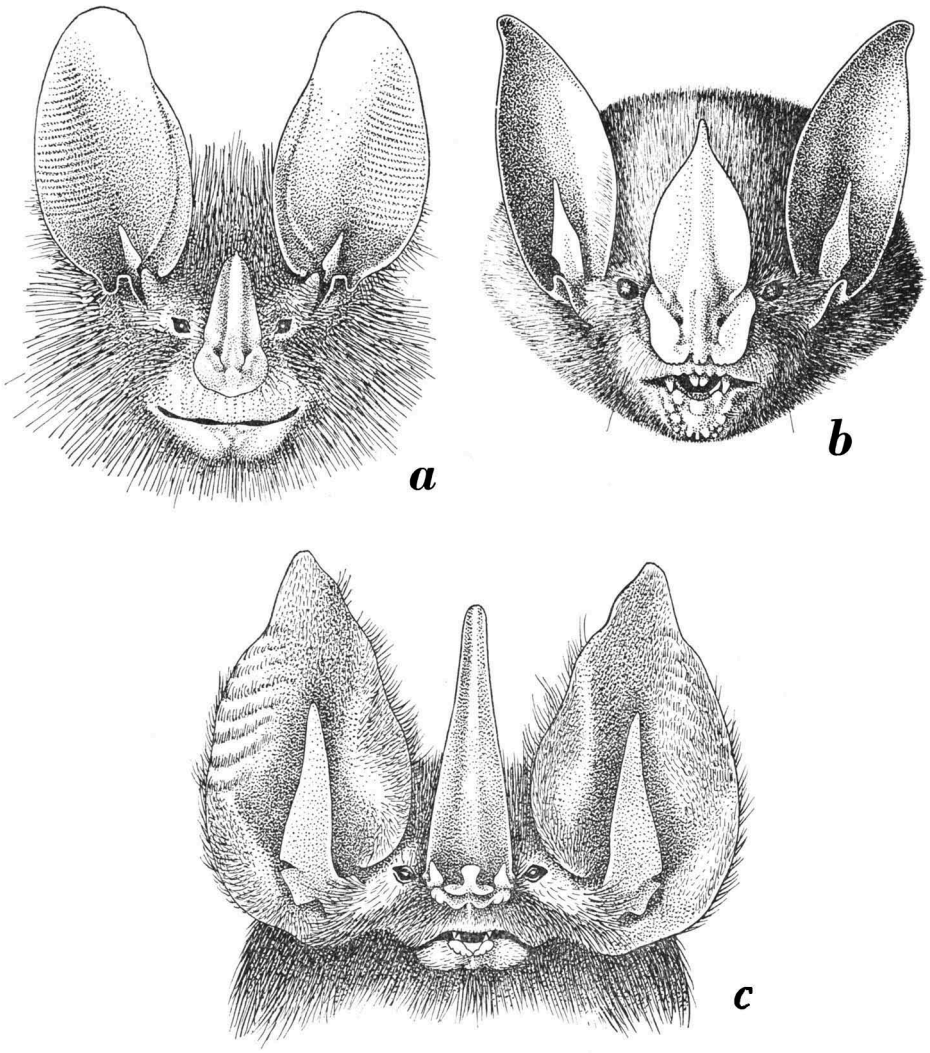

Fig. 9. a, *Chrotopterus auritus guianae* Thomas, ZMA, no. 1622; b, *Macrophyllum macrophyllum* (Wied), BMNH, no. 3.10.1.94; c, *Lonchorhina aurita* Tomes, RMNH, reg. no. 16844. These three species are actually not reported from Suriname, but their occurrence there is most probable.

Chilonycteris rubiginosa has been reported to inhabit caves, mines, tunnels, etc. Our Suriname specimen has been collected in the Anton van Aerde Cave on the Tafelberg in the interior part of Suriname, together with some specimens of *Anoura geoffroyi geoffroyi* Gray, and thus confirms the preference of the species for subterranean cavities.

It is possible that a second species of the genus *Chilonycteris* occurs in Suriname, namely *Ch. personata* Wagner. This species resembles *Ch. rubiginosa rubiginosa* in a very striking way though in all its dimensions it is much smaller. According to Felten (1956a, p. 74) the length of the forearm in his 37 specimens from El Salvador varied from 41 to 47 mm (mean: 44.4 mm).

Subfamily PHYLLOSTOMINAE

The main character by which the Phyllostominae differ from all other Phyllostomid bats (except the Chilonycterinae) is that of the structure of the molars, of which the cusps and commissures are never so reduced that the W-pattern is not evident (see Miller, 1907a, pp. 118; 122-123). In all species the nose leaf as well as the interfemoral membranes are well developed, but there are considerable differences among the various species in the extent of the tail and the length of the calcar; the attachment of the wings also may be widely different in different species (fig. 12 a-e).

In the collections of Suriname bats examined by me ten species of Phyllostominae are represented; no other species of this subfamily have been reported from Suriname in the literature studied. However, considering the distribution of the Neotropical Phyllostominae, it would not be surprising if the following species not yet reported from Suriname would actually occur there: *Lonchorhina aurita* Tomes, *Micronycteris brachyotis* (Dobson), *Macrophyllum macrophyllum* (Wied), *Phyllostomus latifolius* Thomas, *Phylloderma stenops* Peters, *Tonatia bidens* (Spix), and *Chrotopterus auritus guianae* Thomas. For this reason these species are included in the following key (see also figs. 9, 10, 12a-c). These species are not dealt with separately in the text except for *Phylloderma stenops* from French Guiana of which a redescription is given here, because the holotype is present in the Leiden Museum. Since *Micronycteris brachyotis, Tonatia bidens,* and *Phyllostomus latifolius* are closely related to *Micronycteris megalotis megalotis, Tonatia silvicola laephotis,* and *Phyllostomus elongatus,* respectively, some remarks on the former species are given under the latter.

Key to the Suriname Phyllostominae

1. External tail absent or rudimentary: length of forearm more than 70 mm . . 2
— Tail present; in most species the length of the forearm is less than 70 mm . . 3
2. Two lower incisors (fig. 10c); tail rudimentary, may be discerned with some difficulty; length of forearm varying from 77 to 83 mm; wings from the base of the outer toe; fur long and soft; dorsal surface dark brown, ventral surface greyish; wing membranes dark brown, the ends being broadly white . . . . . *Chrotopterus auritus guianae* Thomas

— Four lower incisors (fig. 18a); no external tail; length of forearm about 105 mm . . . . . *Vampyrum spectrum*, p. 117

3. Tail enclosed in the interfemoral membrane, extending to the posterior border . 4
— Tail short, but distinct, enclosed in the interfemoral membrane, reaching the middle of the membrane or falling short of it; in some species the membrane is perforated by the tail, the extreme tip of the tail appearing free on the dorsal surface . . 5

4. Length of forearm varying from 34 to 39 mm; the distal part of the ventral surface of the interfemoral membrane with peculiar dermal denticles which are arranged longitudinally in more or less parallel rows; wing membrane from the distal half of the tibia; calar of about the same length as the tibia (fig. 12a); fur rather long and soft; dorsal surface sooty brown, ventral surface a shade paler . . . . . *Macrophyllum macrophyllum* (Wied)
— Length of forearm varying from 47 to 52 mm; calcar about two-thirds the length of the tibia; wing membrane sheathing the extremity of the tibia and arising from the proximal extremity of the calcar (fig. 12c); nose leaf long and slender (fig. 9c); dorsal surface dark brown, ventral surface a shade paler . *Lonchorhina aurita* Tomes

5. Two lower incisors 6
— Four lower incisors 10

6. Ears connected by a low band across the forehead 7
— Ears not connected by a band across the forehead 8

7. Length of forearm varying from 53 to 59 mm . . *Tonatia silvicola laephotis*, p. 84
— Length of forearm about 45 mm . . . . . *Tonatia carrikeri*, p. 89

8. Wing membranes from the ankles; length of forearm varying from 51 to 53 mm . . . . *Mimon bennettii*, p. 91
— Wing membranes from the side of the hind feet near the base of the outer toe . 9

9. Nose leaf with margin of the lancet finely crenulate (fig. 15b), fringed with straight hairs; length of forearm varying from 45 to 51 mm . . *Anthorhina crenulata*, p. 94
— Nose leaf with margin of the lancet entire; length of forearm varying from about 55 to 59 mm (see page 88) . . . . . *Tonatia bidens* (Spix)

10. Length of forearm less than 50 mm 11
— Length of forearm more than 50 mm 12

11. Length of forearm varying from 31.8 to 36.2 mm; ears connected by a low band across the forehead (fig. 14c); first phalanx and second phalanx of the third digit of about equal length . . . . . *Micronycteris megalotis megalotis*, p. 80
— Length of forearm about 40 mm; ears not connected by a low band across the forehead; first phalanx of third digit much shorter than the second phalanx, being about 14 and 18 mm, respectively (see page 83) . . . *Micronycteris brachyotis* (Dobson)

12. Nose leaf with the margin of the lancet finely toothed (fig. 15d) . . . . . *Trachops cirrhosus cirrhosus*, p. 115
— Nose leaf with the margin of the lancet entire 13

13. Calcar distinctly shorter than the hind foot 14
— Calcar about as long as or longer than the hind foot 15

14. Length of forearm varying from 67 to 70 mm; wing membranes from the side of the hind foot (fig. 12d) . . . . . *Phylloderma stenops*, p. 111
— Length of forearm varying from about 55 to 65 mm; wing membranes from the ankles (figs. 12e) . . . . . *Phyllostomus discolor discolor*, p. 98

15. Length of forearm varying from 79 to 88 mm; nose leaf shorter than the hind foot . . . . *Phyllostomus hastatus hastatus*, p. 106
— Length of forearm less than 75 mm 16

16. Length of forearm varying from 62 to 68 mm; length of tibia from 24 to 30 mm . . . . *Phyllostomus elongatus*, p. 102
— Length of forearm varying from 58 to 60 mm; length of tibia from 21 to 23 mm (see page 104) . . . . . *Phyllostomus latifolius* Thomas

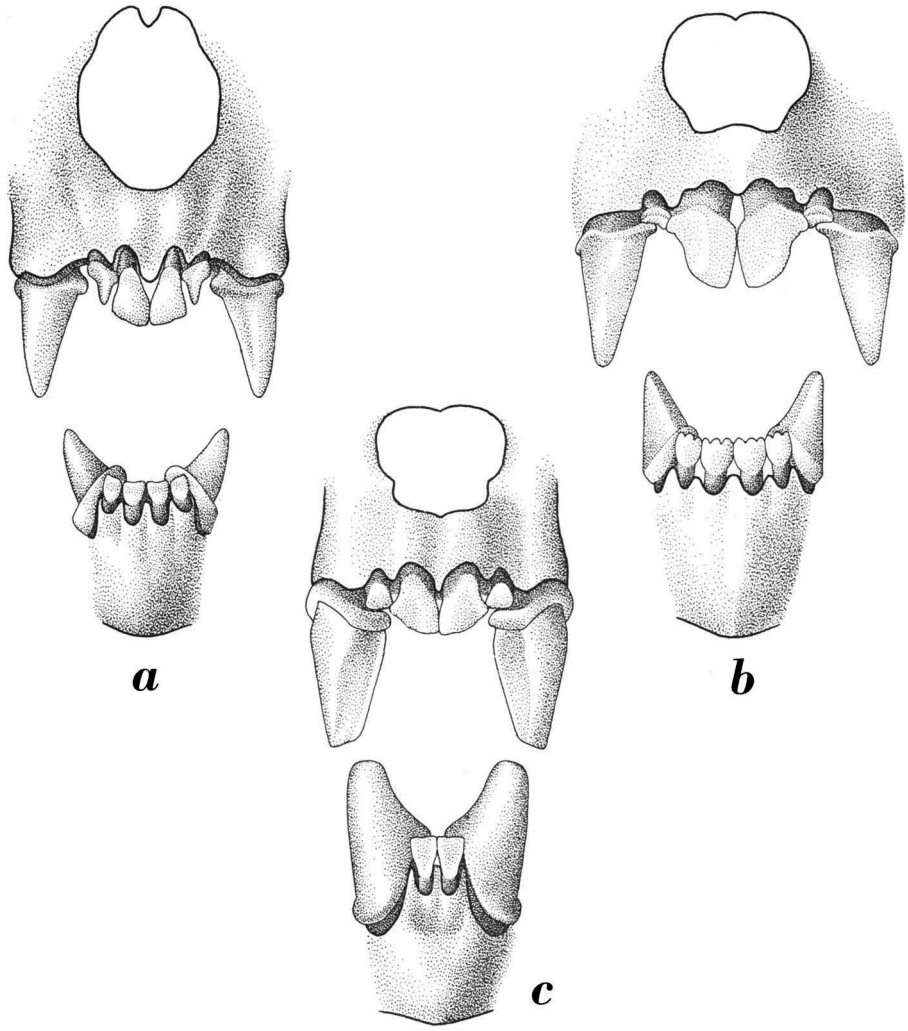

Fig. 10. Canines and incisors in front view. a, *Lonchorhina aurita* Tomes, RMNH, reg. no. 16844; b, *Macrophyllum macrophyllum* (Wied), BMNH, no. 11.4.28.7; c, *Chrotopterus auritus guianae* Thomas, RMNH, reg. no. 5001. Width across cingula canines in mm: a, 4.5; b, 3.5; c, 7.7.

Micronycteris megalotis megalotis (Gray)

(figs. 11a, 14c, 16c; pl. VIII)

Phyllophora megalotis Gray, 1842, Ann. Mag. Nat. Hist., ser. 1, vol. 10, p. 257.
Schizostoma megalotis, Kappler, 1881, Holländisch-Guiana, p. 163.
Phyllostoma elongatum (p.p.), Jentink, 1887, Mus. Hist. Nat. Pays-Bas, vol. 9, p. 291; 1888, vol. 12, p. 206.

Type locality. — "Brazils". Restricted by Cabrera (1958, p. 60) to Pereque, São Paulo, Brazil, the first exact Brazilian locality mentioned by Andersen (1906, p. 54).

Distribution. — The present species has a wide distribution, its range extends from southern Brazil and Peru north to southern Mexico. The typical form occurs from southern Brazil and Peru north to the Guianas, Colombia, Venezuela, and the islands Trinidad and Tobago. For the other subspecies see Sanborn (1949a, p. 219).

Specimens examined.

Kwatta near 2de Rijweg, Paramaribo; April 27, 1958, G. Rijnenberg; RMNH, reg. no. 17367: male, preserved in alcohol, skull inside; reg. no. 17295: male, dried skin and skull.

Paramaribo; September 1926, Périn; ZMA, no. 1629: male, preserved in alcohol, skull extracted.

Suriname; between 1824 and 1836, H. H. Dieperink; RMNH, reg. no. 15904: male, dried skin in poor condition, damaged skull (= Jentink's 1888 *Phyllostoma elongatum,* no. a, and his 1887 *Ph. elongatum,* no. c, respectively).

Suriname; 1870, A. Kappler; SMN, Nr. 1408: female, preserved in alcohol, damaged skull extracted.

Suriname; date unknown, A. Kappler; ZMB, Nr. 3353, a and b: female and male, respectively, preserved in alcohol, damaged skulls extracted.

Suriname; date unknown, A. Kappler; ZMB, Nr. 4265, a, b, and c: males, preserved in alcohol, skulls extracted; Nr. 4265, d and e: females, preserved in alcohol, damaged skulls extracted.

Suriname; date unknown, A. Kappler; ZMB, Nr. 3222, a, d, and e: males, preserved in alcohol, skulls extracted (nos. d and e strongly damaged); Nr. 3222, b and c: females, preserved in alcohol, skulls extracted.

Description. — Dobson (1878, pp. 478-479; pl. xxiv fig. 5: head, front view); Andersen (1906, pp. 52-54); Miller (1907a, pp. 123-124; pl. iii fig. 1: right upper tooth-row, occlusal view; pl. iv fig. 1: right lower tooth-row, occlusal view); Vieira (1942, pp. 307-309; fig. 17: animal, ventral view); Sanborn (1949a, pp. 216-219; fig. 41: skull); Goodwin & Greenhall (1961, pp. 227-228; fig. 25: ears, front view; pl. 12 figs. 4-6: skull). The original 1842 description by Gray is extremely short and incomplete.

Length of forearm varying from 31.8 to 36.2 mm; third metacarpal shortest, fifth longest; first phalanx of third digit about as long as second phalanx; nose leaf small, but distinct, lancet up to 7.8 mm long and 5.2 mm broad; ears large and rounded, up to 18 mm long and 15.5 mm broad, connected by a band across the forehead, this band shallowly notched in the centre, tragus small; interfemoral membrane well developed, when stretched its posterior margin extending to the level of the ankles; calcar longer than hind foot with claws, but shorter than tibia; tail reaching almost the middle of the membrane, its extreme tip appearing on the dorsal surface of the membrane; wing membrane from the ankles. Fur dense and soft, extending

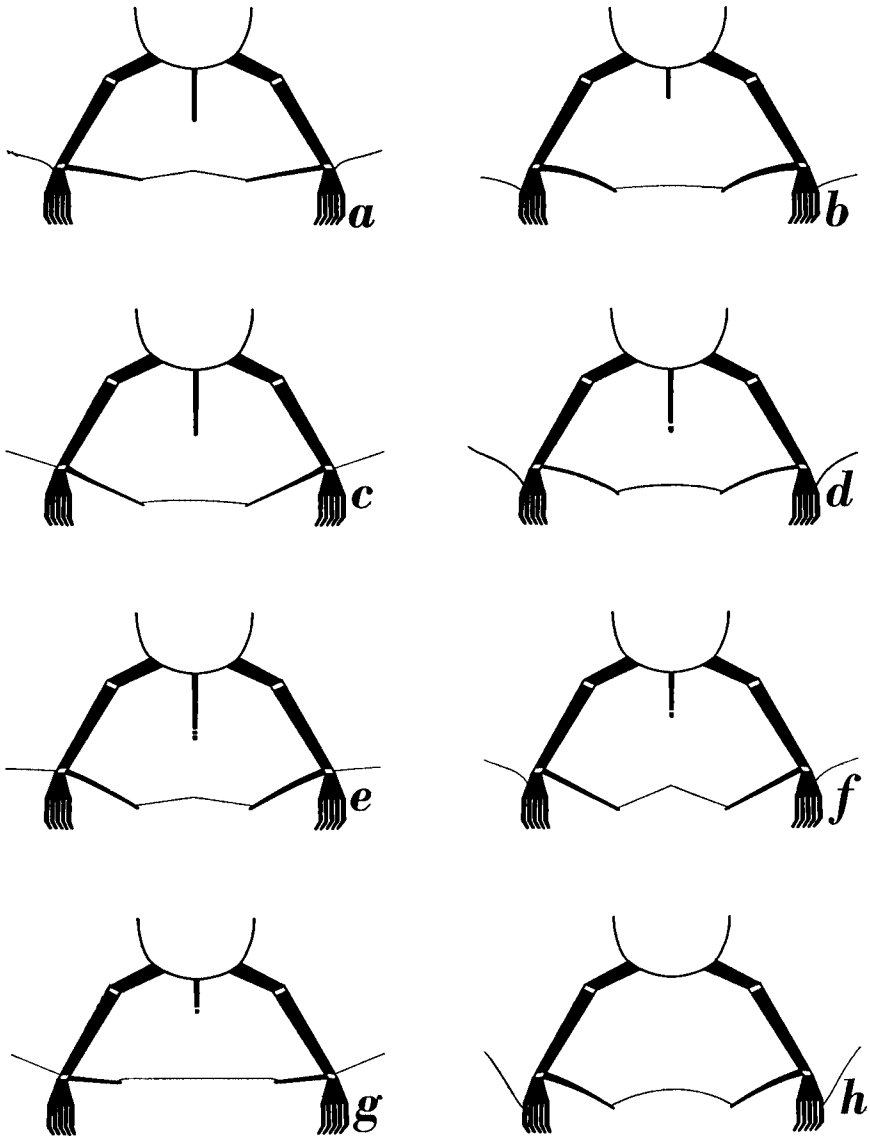

Fig. 11. Diagrams of interfemoral membranes, ventral view, showing the various forms to be observed in Suriname Phyllostominae. a, *Micronycteris megalotis megalotis* (Gray); b, *Tonatia carrikeri* (J. A. Allen); c, *Mimon bennettii* (Gray); d, *Anthorhina crenulata* (E. Geoffroy); e, *Phyllostomus elongatus* (E. Geoffroy); f, *Phyllostomus hastatus hastatus* (Pallas); g, *Trachops cirrhosus cirrhosus* (Spix); h, *Vampyrum spectrum* (L.).

on the upper arm, but hardly on the almost quite naked membranes. Dorsal surface of body dark brown, bases of hairs usually pure white; ventral surface of about the same brown colour as dorsal surface, but hairs uniformly coloured; membranes dark to blackish brown.

Dental formula: $\frac{2.1.2.3}{2.1.3.3}$. Upper incisors completely filling the space between the canines, the inner about half as high as the canines, the outer minute, scarcely exceeding the cingulum of the inner; inner upper incisors at base distinctly separated, but in contact with each other in the middle, the tips slightly diverging; cutting edge of the inner incisor notched near the outer side, forming two unequal lobes; first and second upper premolars subequal in size and height, about half as high as canine. Lower incisors forming a continuous semicircular row between the canines, their cutting edges faintly bifid; first lower premolar distinctly larger and higher than second and third premolars, the latter two are subequal in height; the base of the middle premolar is slightly shorter than that of the last premolar, which is often a trifle higher than the second; the three lower premolars stand perfectly in the tooth-row, touching each other, the anterior premolar touches the canine, and the posterior premolar is in contact with the first molar.

The external and skull measurements of nine of the examined specimens are given in Table VII.

Remarks. — The examined Suriname material of *Micronycteris megalotis megalotis* does not give rise to special remarks, the specimens agree very well with the descriptions and the measurements found in the literature mentioned above. All examined specimens, with the exception of the two Kwatta animals, are bleached; therefore it is impossible to ascertain the range of colour variation of this species in Suriname. According to Andersen (1906, p. 53) two extremes in the colour of the fur may occur, these extremes being connected by several transitional stages; in the one extreme colour phase a tinge of russet is present, which is completely absent in the other extreme.

According to the collector's note on the label of the two Kwatta specimens, they were captured in a barn.

It is possible that a second species of the genus *Micronycteris* occurs in Suriname, namely *M. brachyotis,* a species originally described by Dobson (1879, p. 880) from Cayenne, French Guiana. It was placed by Andersen (1906, p. 60) in the genus *Glyphonycteris,* which at present is generally considered to be a subgenus of *Micronycteris* (see Sanborn, 1949a, p. 231). Dobson's species seems to be extremely rare, since it is known from the type only. The main characters by which *M. brachyotis* differs from *M. megalotis*

TABLE VII

External and skull measurements of nine specimens of *Micronycteris megalotis megalotis* (Gray) from Suriname.

Museum	RMNH	ZMA	ZMB	ZMB	ZMB	ZMB	ZMB	ZMB	ZMB
Reg. number	17295	1629	4265b	3222a	4265a	4265c	3222b	3222c	4265e
Sex	♂	♂	♂	♂	♂	♂	♀	♀	♀
Forearm	35.7	34.5	31.1	31.4	33.0	34.4	34.9	33.0	35.0
Third digit, metacarpal	30	29	26	26.3	27.5	28.5	29	27	29.5
1st phalanx	13	14	11.5	11.5	11.5	12.5	13	11.5	13.5
2nd phalanx	13	14	11	11.5	11.5	14	13	12	14.5
3rd phalanx	9	9.5	9	8	10	9.5	8.5	9	9.5
Fourth digit, metacarpal	30	29.5	26.5	26.5	28	29.5	29.5	27.5	30
1st phalanx	10.5	10	9	9	9	9.5	10	9.5	10.5
2nd phalanx	9	9	9	8.5	8	10	9	9.5	10
Fifth digit, metacarpal	31	31	27.5	26.8	29	30	30.3	28	30.5
1st phalanx	10.5	11	9	9.5	9.5	10	10.5	9.5	11
2nd phalanx	9	9	9.5	9	10	10.5	9.5	9	9.5
Tibia	15.5	15	15	15	15.5	15	15	15	15
Hind foot	9.5	9	9	9	9.5	10	9	9.5	9
Calcar	10.8	10.5	9.5	9	10	10.5	10	9	10
Skull:									
greatest length	18.5	18.6	17.1	17.1	17.7	17.3	17.5	17.5	17.3
condylobasal length	16.6	16.3	15.2	15.0	15.5	—	15.3	15.5	—
condyle to front of canine	16.2	16.2	15.0	14.6	15.2	—	15.1	15.2	—
basal length	14.5	14.0	12.8	13.0	13.2	—	13.3	13.3	—
palatal length	8.5	8.5	7.3	7.3	7.4	—	7.9	7.9	—
zygomatic breadth	—	9.2	8.2	8.5	8.7	—	9.0	—	8.7
breadth of braincase	7.7	7.6	7.0	7.3	7.2	7.2	7.4	7.3	—
height of braincase	7.3	7.4	6.8	7.1	7.0	—	7.1	7.0	—
mastoid breadth	8.5	—	7.8	8.1	8.1	8.1	8.5	8.0	—
postorbital constriction	4.1	4.2	3.7	3.8	3.9	4.1	4.0	3.9	4.0
width across molars	6.3	6.0	5.6	5.6	5.9	6.1	5.8	5.7	5.8
width across cingula canines	3.3	3.2	2.9	2.9	2.9	3.0	2.9	2.9	3.0
upper tooth-row, c - m^3	7.1	7.2	6.6	6.4	6.6	6.6	6.6	6.5	6.5
lower tooth-row, c - m_3	7.6	7.7	7.1	6.9	7.1	7.1	7.3	7.0	7.1
length of mandible	12.1	11.9	11.0	10.7	11.2	11.5	11.3	11.3	11.3

are: (1) the length of the forearm is about 40.5 mm instead of at most 36.5 mm; (2) no transverse band connects the ears across the forehead; (3) the fourth metacarpal is shortest, the third and the fifth are about equal in length, while the second phalanx of the third digit (about 17.8 mm) is considerably longer than the first, which is about 14 mm in the type.

Tonatia silvicola laephotis Thomas

(figs. 14d, 16a; pl. VI)

Tonatia laephotis Thomas, 1910, Ann. Mag. Nat. Hist., ser. 8, vol. 6, pp. 184-185.

Type locality. — In the original description no type locality was given, but since Thomas in the introduction of his paper stated that his list is

based on a collection of mammals "from the River Supinaam, a tributary of the Lower Essequibo", while he also named his paper "Mammals from the River Supinaam, Demerara", it is evident that the type locality is: River Supinaam, Demerara, British Guiana.

Distribution. — *Tonatia silvicola laephotis* was recorded from the coastal region of British Guiana and from the Lower Amazon basin in Brazil. The typical form has a wide range extending from the Matto Grosso, Brazil, west and north through Bolivia, Peru, Ecuador, Colombia, and Panama to British Honduras (Goodwin, 1942a, p. 208 and p. 209).

Specimens examined.

Between Moengotapoe and Wiawia, coastal region, north-east Suriname; October 24, 1948, Suriname Expedition 1948/1949; RMNH, reg. no. 15786: male, preserved in alcohol, skull extracted; reg. no. 15787: female, preserved in alcohol, skull strongly damaged; reg. no. 15785: female, dried skin and skull.

Suriname; date unknown, A. Kappler; ZMB, Nr. 4214: female, preserved in alcohol, skull extracted.

Description. — Miller (1907a, pp. 128-129); Thomas (1910, pp. 184-185); Goodwin (1942a, p. 209). The short original description given by Thomas (1910) has been emended by Goodwin (1942) who, besides giving the external measurements of an adult male and female, recorded in his description the range of the skull measurements of 16 specimens, which show that in many dimensions the females are distinctly smaller than the males.

Length of forearm varying from 53 to 59 mm (mean of 7 specimens: 56 mm); ears large and broad, rounded above, longer than the head, about 28 mm long and 18 mm broad; behind each ear there is a small connecting band, the two bands touching each other nearly in the middle of the forehead between the ears; tragus well developed, attenuated in its upper third, the basal part of its outer margin has three small tooth-like projections; nose leaf well developed, fused with upper lip, distance between tip of nose leaf and margin of upper lip about 12 mm; interfemoral membrane well developed, when stretched it extends to the level of the ankles; calcar somewhat longer than the hind foot, but somewhat shorter than the total free margin of the interfemoral membrane; tail extending to about one-third the length of the interfemoral membrane, the extreme tip appearing on its dorsal surface; the wing is attached on the dorsal surface of the hind foot near the base of the fourth toe. Fur soft, extending on the basal half of the humerus, above and beneath; hairs of the dorsal surface dark mummy brown, the tips being pale buff; the hairs of the neck and behind the ears are for the greater part white with dark tips; on the ventral surface the fur of the chin is distinctly whitish, this colour gradually passes in the more silvery greyish

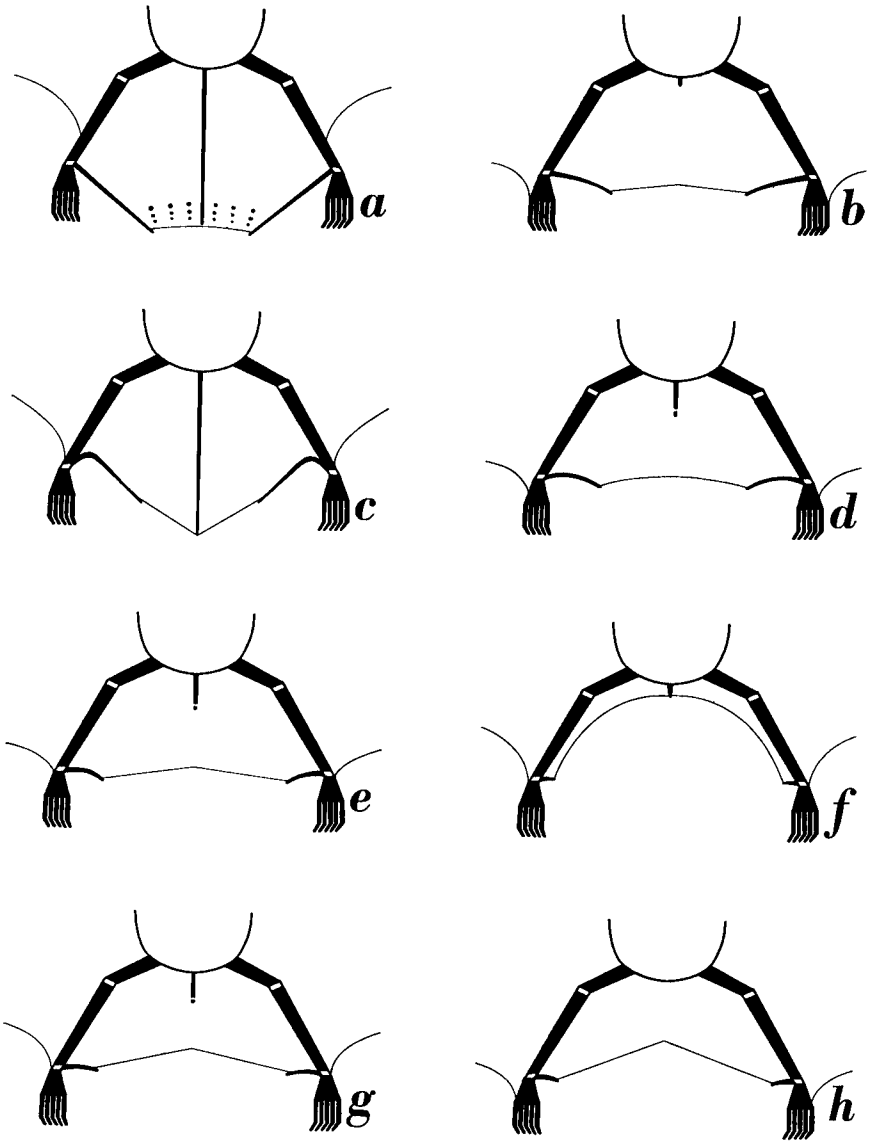

Fig. 12. Diagrams of interfemoral membranes, ventral view, showing the various forms to be observed in Phyllostominae (a-e), Glossophaginae (f), and Carolliinae (g-h). a, *Macrophyllum macrophyllum* (Wied); b, *Chrotopterus auritus guianae* Thomas; c, *Lonchorhina aurita* Tomes; d, *Phylloderma stenops* Peters; e, *Phyllostomus discolor discolor* (Wagner); f, *Lonchoglossa caudifer caudifer* (E. Geoffroy); g, *Carollia perspicillata perspicillata* (L.); h, *Rhinophylla pumilio* Peters.

or greyish tinges of the abdomen; the sides of the body are more greyish brown, but paler than the dorsal surface. Wings blackish brown, the lower part of the wing between the second and fifth fingers lighter, contrasting sharply, at least in the examined specimens, with the yellowish white colour of the metacarpals and phalanges.

Dental formula: $\frac{2.1.2.3}{1.1.3.3}$. Inner incisor much larger than the forward crowded outer incisor, the latter completely filling the space between the canine and the inner incisor; anterior upper premolar much broader than long; postorbital constriction narrower than width across cingula canines; sagittal crest well developed in both sexes, running from the middle of the postorbital constriction to the basioccipital, not divided anteriorly. Lower incisors much higher than wide; lower canines posteriorly nearly in contact with each other; small middle lower premolar much wider than long, crowded outward, but in such a way that it still touches both the first and third premolars, so that these are separated.

External and skull measurements of the examined male (RMNH reg. no. 15786) and the two females (ZMB Nr. 3214, and RMNH reg. no. 15785, respectively). Forearm, 57.2, 55.2, 57.0; length of third metacarpal, 46.5, 43, 46; first phalanx, 20, 19, 21; second phalanx, 21, 20.5, 21; third phalanx, 21, 19, 20; length of fourth metacarpal, 45.5, 43, 45; first phalanx, 19, 17.5, 18.5; second phalanx, 19, 18.5, 18; length of fifth metacarpal, 49, 47.5, 50; first phalanx, 18, 17.5, 18; second phalanx, 19, 18.5, 16.5; tibia, 30, 29, 30; calcar, 18, 17, 16. — Skull: greatest length, 27.7, 26.6, 28.0; condylobasal length, 24.0, 23.1, 24.0; condyle to front of canine, 24.1, 23.0, 23.7; basal length, 20.4, 19.8, 20.3; palatal length, 11.9, 11.5, 12.1; zygomatic breadth, 14.1, 12.9, 13.7; breadth of braincase, 11.2, 10.3, 10.5; height of braincase, 10.6, 10.1, 10.6; mastoid breadth, 14.6, 13.3, 13.8; postorbital constriction, 4.1, 3.9, 4.0; width across molars, 9.4, 8.4, 9.0; width across cingula canines, 6.5, 5.5, 5.8; upper tooth-row, c-m^3, 10.2, 9.6, 10.0; lower tooth-row, c-m_3, 11.6, 10.5, 11.0; length of mandible, 18.2, 17.5, 18.1.

Remarks. — Both the date of publication and the spelling of the specific name *silvicola* D'Orbigny have been differently cited by different authors. The name was first published in the combination *Lophostoma silvicola* on plate 6 of D'Orbigny's "Voyage en Amérique méridionale" where an excellent illustration of the species is given. According to Sherborn & Griffin (1934, p. 130) this plate was published in 1836 in Livraison 17 of D'Orbigny's work. The year of publication of the species thus is 1836, even though the description did not appear till 1847 (D'Orbigny & Gervais, 1847, p. 11). On D'Orbigny's plate the name is spelled *silvicola* and this is therefore the

correct spelling notwithstanding the fact that the name has been emended by later authors to *sylvicola, sylvicolum,* etc. Wagner's (1843, p. 365) name *Phyllostoma amblyotis* for the same species must be considered a junior synonym of *Lophostoma silvicola.*

Tonatia laephotis was originally described by Thomas (1910) as a good species, distinguishable from *T. silvicola* by its larger size. Also the revisor of the genus *Tonatia,* Goodwin (1942a, p. 209), accepted its specific status. However, Laurie (1955, pp. 268-269; table I), basing herself on the fact that "in some cases their measurements are almost identical", considered *T. laephotis* to be a synonym of *T. silvicola.* A comparison of the measurements of *T. silvicola,* as given by Sanborn (1936, p. 97), Goodwin (1942a, p. 208), Dorst (1951, p. 603; 1953, p. 270), and Laurie (1955, p. 270) with those of *T. laephotis* shows that on an average the latter species is larger than the former. Therefore it seems justified to me to consider at least provisionally the two forms subspecifically different, as was also done by Cabrera (1958, p. 64); the present material falls entirely within the range of *T. s. laephotis.*

It is possible that also *Tonatia bidens* (Spix) occurs in Suriname, since Goodwin (1942a, p. 205) examined a specimen from Kartabo, British Guiana. This species was erroneously reported from Suriname by Jentink (1887, p. 291): examination of the strongly damaged skull of Jentink's specimen proved that it belongs to *Mimon bennettii* (Gray). *Tonatia bidens* is of about the same size as *T. silvicola laephotis,* the length of the forearm varying from 55 to 59 mm, but it can be distinguished from the last mentioned species (1) by the shorter ears, which are as long as the head, and are not connected by a low band across the forehead, and (2) by that the postorbital region is not constricted, being as wide as the width across the upper canines (about 5.5 mm); in *T. silvicola laephotis* the postorbital constriction is narrower than the width across the canines (see the measurements above).

In the permanent dentition of *Tonatia* two upper premolars are present. It is interesting to note that Dorst (1957) found that in the milk dentition of *T. silvicola* three upper premolars are present, of which the first is much smaller than the second or the third.

The correct spelling of the specific name of Thomas's species is *laephotis* and not *loephotis* as it is sometimes written. The types of print for the diphthongs *ae* and *oe* used in the Annals and Magazine of Natural History, at least in the volume concerned, are quite different; this is clearly shown on comparison of the diphthong *oe* in the generic name *Coenobasis* on page 147 of that volume with the diphthong *ae* of the name *laephotis* on page 184.

Tonatia carrikeri (J. A. Allen)

(figs. 11b, 14b; pl. VI)

Chrotopterus carrikeri J. A. Allen, 1910, Bull. Amer. Mus. Nat. Hist., vol. 28, pp. 147-148.

Type locality. — "Rio Mocho, Venezuela".

Distribution. — Known from the type locality and now reported from Suriname.

Specimen examined.

Suriname; date unknown, A. Kappler; ZMB, Nr. 4234: male, preserved in alcohol, skull extracted.

Description. — The only author dealing with the present species after the publication of the original description was Goodwin (1942a, pp. 207-208).

The following characters are based on the examined Suriname specimen. Length of forearm, 44.6 mm; ears longer than the head, united by a low band across the forehead with a shallow notch in the centre; tragus attenuated, bidentate, the projection of the inner margin below the middle, that of the outer margin more near the base; nose leaf well developed, about 9 mm high and 6 mm broad; margin of the upper lip entire, warts of the lower lip vague; calcar well developed, somewhat larger than the hind foot, about equal in length to the free margin of the interfemoral membrane; the tail, from anus about 10.5 mm long, is enclosed in the basal part of the membrane, ending at about one-fourth of the length of the membrane; interfemoral membrane well developed, when stretched reaching to about the level of the metatarsus; wing membrane starting from the dorsal surface of the hind foot near the base of the outer toe.

The Suriname specimen, which has been preserved for about a hundred years, is too bleached by the action of the preservative to give a correct idea of the original coat colour; so the head and wings are practically white. Goodwin (1942a, p. 207) described the colour as follows: "General color of upperparts Mummy brown, the hairs finely tipped with pale buff, extreme base of fur white; underparts pure white to roots of hair except on chin and sides of abdomen". In the original description J. A. Allen (1910, p. 147) noted: "... nose, chin, and a broad band passing below the base of the ears blackish brown; throat, breast, and middle of abdomen pure white; sides and anal region grayish brown, restricting the white to the median ventral area; membranes very dark brown or black". The fur consists of very soft hairs, extending above and beneath over the proximal two-thirds of the humerus.

Dental formula: $\frac{2.1.2.3}{1.1.3.3}$. The skull and teeth show all essential characters

given by Miller (1907a, pp. 128-129) for the genus *Tonatia*. However, the palate ends on a line connecting the posterior borders of the second molars, and the small middle lower premolar, crowded between the first and third premolars, stands perfectly in the tooth-row, being much wider than long. The sagittal crest is sharply defined from the middle of the relatively

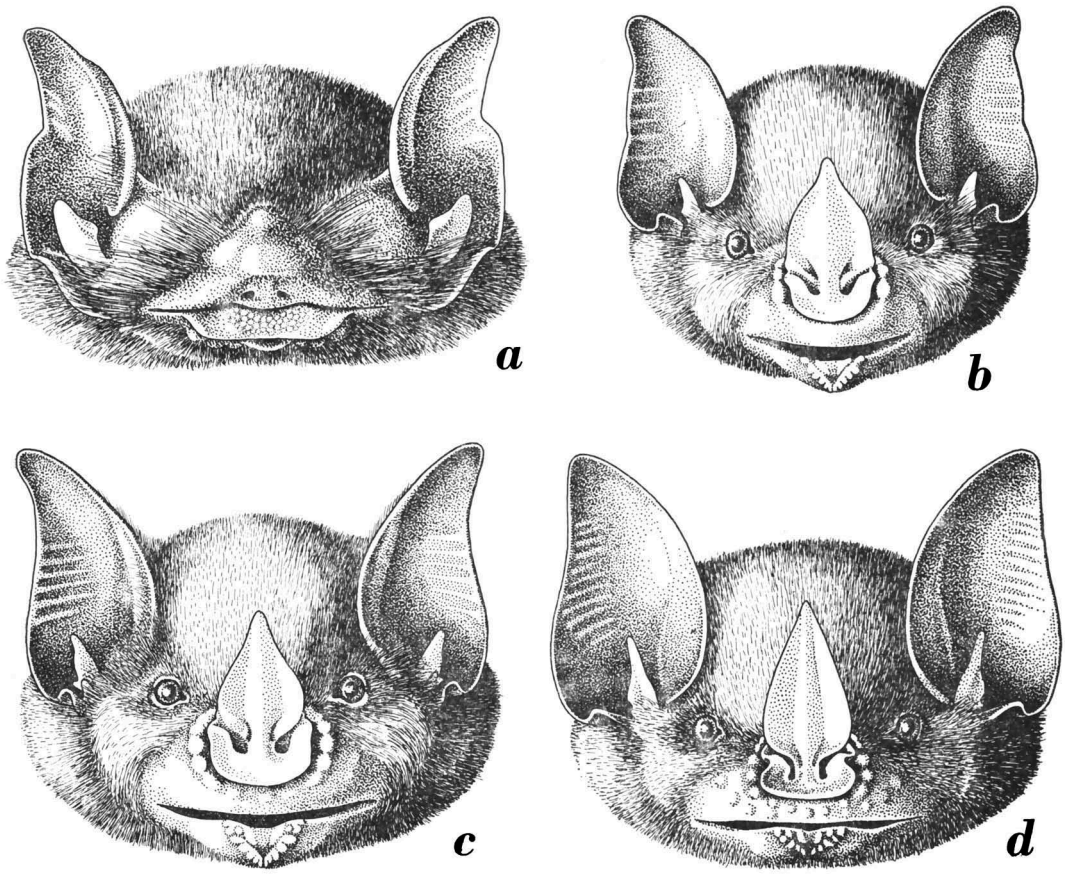

Fig. 13. a, *Chilonycteris rubiginosa rubiginosa* Wagner, RMNH, reg. no. 16420; b, *Phyllostomus discolor discolor* (Wagner), ZMB, Nr. A 1838; c, *Phyllostomus hastatus hastatus* (Pallas), SMN, Nr. 240; d, *Phyllostomus elongatus* (E. Geoffroy), ZMB, Nr. 3217.

narrow postorbital constriction to the basioccipital, this constriction is narrower than the width across the cingula of the canines.

External and skull measurements of the Suriname specimen. Forearm, 44.6; length of third metacarpal, 37.5; first phalanx, 15; second phalanx,

19; third phalanx, 10; length of fourth metacarpal, 38.5; first phalanx, 15; second phalanx, 15; length of fifth metacarpal, 40.5; first phalanx, 15.5; second phalanx, 17; ear, from meatus, 21.5; ear, breadth, 14.5; tragus, 7; tibia, 22; hind foot, 13; depth of interfemoral membrane, 35; tail from anus, 10.5; calcar, 15. — Skull: greatest length, 23.2; condylobasal length, 19.6; condyle to front of canine, 19.6; basal length, 17.5; palatal length, 9.4; zygomatic breadth, 11.6; breadth of braincase, 9.3; height of braincase, 9.3; mastoid breadth, 11.5; postorbital constriction, 3.5; width across molars, 7.6; width across cingula canines, 4.7; upper tooth-row, c-m^3, 8.2; lower tooth-row, c-m_3, 9.0; length of mandible, 14.4.

Remarks. — Since I have not examined any Venezuelan material of *Tonatia carrikeri* it is with some reserve that the present Suriname specimen is assigned to that species. In its dimensions it is smaller than the adult male described by Goodwin (1942a, p. 208) but it agrees rather well with the adult female dealt with by that author. Unfortunately neither Allen nor Goodwin gave a description of the shape of the tragus, which in the Suriname specimen is quite different from that of *Tonatia silvicola laephotis* (see fig. 14b and d).

Mimon bennettii (Gray)

(figs. 11c, 15a, 17a; pl. VII)

Phyllostoma Bennettii Gray, 1838, Mag. Zool. and Bot., vol. 2, p. 488.
Mimon Bennettii, Peters, 1867, Monatsber. Akad. Wiss. Berlin 1867, p. 469.
Lophostoma bidens, Jentink, 1887, Mus. Hist. Nat. Pays-Bas, vol. 9, p. 291.

Type locality. — "S. America". Restricted by Hershkovitz (1951, p. 555) to Ypanema, São Paulo, Brazil; Hershkovitz was of the opinion that this is the first precise locality whence the species has been recorded (Thomas, 1902b, p. 53). Thomas as well as Hershkovitz overlooked Peters's paper (1867, p. 469) in which he expressly stated that he examined "zwei Weingeistexemplaren, welche ich Hrn. Kappler aus Surinam verdanke".

Distribution. — Suriname; southeastern Brazil (region of São Paulo and Santa Catharina). As pointed out by Dalquest (1957a), *Mimon bennettii* has been erroneously reported by several authors from Venezuela and Central America.

Specimens examined.

Suriname; before 1867, A. Kappler; ZMB, Nr. 3350 a and b: adult females, preserved in alcohol, skulls extracted.

Suriname; date and collector unknown; RMNH, reg. no. 17369: strongly damaged skull (= Jentink's 1887 *Lophostoma bidens,* no. a).

Description. — Gray (1838, p. 488); Peters (1866b, pp. 676-678); Dobson (1878, pp. 491-492; pl. xxv fig. 6: head, front view); Miller (1907a, p. 129); Vieira (1942, pp. 296-298; fig. 14: animal, ventral view).

Length of forearm varying from 51 to 53 mm; nose leaf large and broad, length up to 17 mm, breadth up to 8.5 mm; ears large, broad, and pointed, length up to 27 mm, breadth up to 18.5 mm; tragus well developed, about 12 mm in length; interfemoral membrane large, when expanded extending to the bases of the toes; calcar long, about four-fifth the length of the tibia, and shorter than the free margin of the membrane; tail included in the interfemoral membrane, ending about in its middle; wing membrane from the ankles. Fur long and dense, above and beneath; upper parts fulvous-brown, under parts paler.

Dental formula: $\frac{2.1.2.3}{1.1.2.3}$. Upper incisors completely filling the space between the canines, the outer about half as high as the inner, touching the inner as well as the canines; inner incisors in contact in the middle, their tips diverging; first upper premolar about half the size of the second, standing perfectly in the tooth-row, in contact with the canine as well as with the second premolar. Lower incisors higher than wide, as high as the cingulum of the canines; first lower premolar somewhat broader but slightly shorter than the second lower premolar. The auditory bullae are small in comparison to those of the closely related forms of the genus *Anthorhina*.

External and skull measurements of the two examined females from Suriname, ZMB, Nr. 3350 a and b, respectively: length of forearm, 52.2, 51.4; length of third metacarpal, 45.5, 45; first phalanx, 17.5, 17.5; second phalanx, 24, 24; third phalanx, 14, 15; length of fourth metacarpal, 45, 44.5; first phalanx, 15, 15; second phalanx, 16.5, 14; length of fifth metacarpal, 48.5, 48; first phalanx, 15, 14.5; second phalanx, 15, 13.5; ears, length, 27, 27; ears, breadth, 18.5, 18; length of tragus, 12, 11; nose leaf, length, 17, 17; nose leaf, breadth, 8.5, 8; tibia, 22.5, 22; hind foot, 14, 15; calcar, 18, 17; depth of interfemoral membrane, 40, 38; length of tail, 20, 20. — Skull: greatest length, 25.1, 25.0; condylobasal length, 21.8, 22.3; condyle to front of canine, 21.6, 21.5; basal length, 19.6, 19.8; palatal length, 12.2, 12.1; zygomatic breadth, 13.7, 13.7; breadth of braincase, 9.8, 9.8; height of braincase, without crest, 9.5, 10.0; mastoid breadth, 11.6, 11.5; postorbital constriction, 4.5, 4.7; width across molars, 9.2, 9.4; width across cingula canines, 5.7, 5.5; upper tooth-row, c-m^3, 9.2, 9.2; lower tooth-row, c-m_3, 10.3, 10.3; length of mandible, 16.6, 16.6.

Remarks. — In the dried type specimen of *Mimon bennettii* the calcar is apparently as long as or slightly longer than the tibia (Peters, 1866b, pp.

677-678; Dobson, 1878, p. 492). In the alcohol specimens from Suriname, however, the calcar is decidedly shorter than the tibia. Unfortunately neither Vieira (1942, p. 298) nor Dalquest (1957a, p. 46) gave the length of the

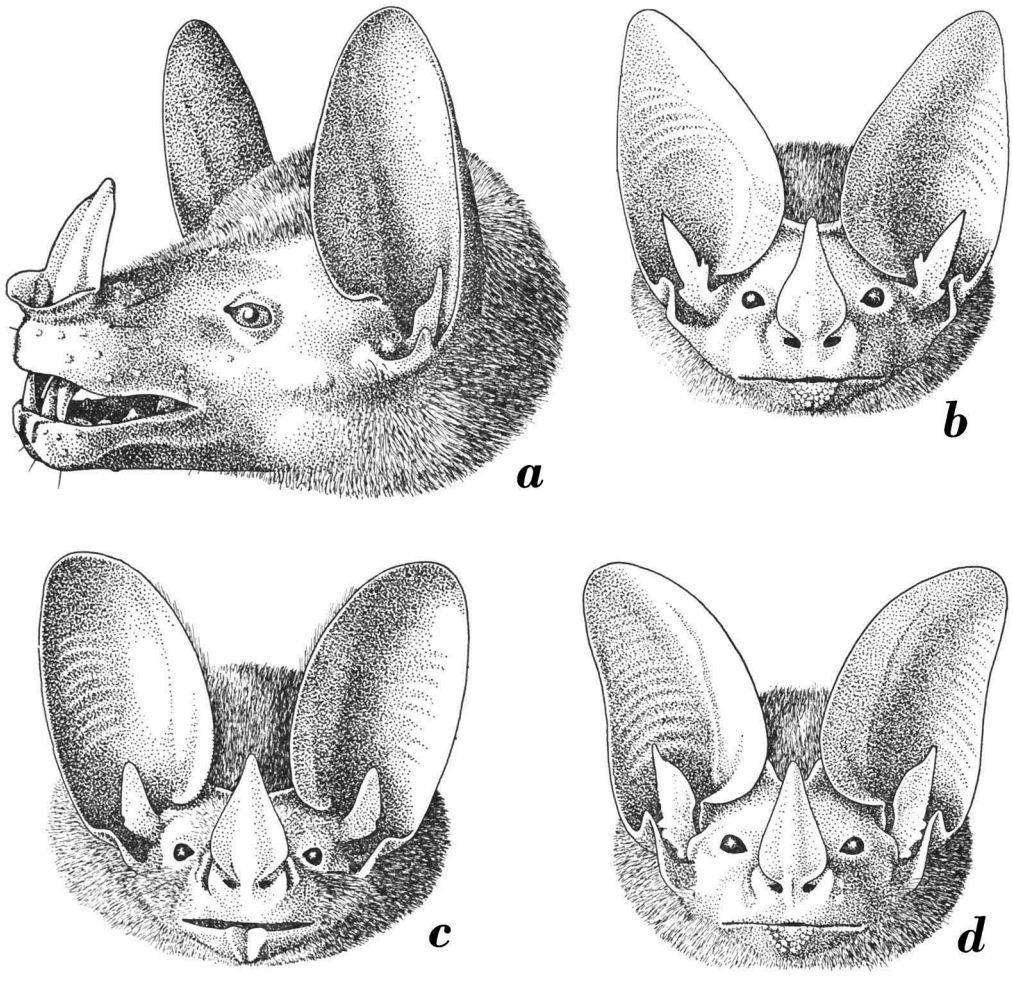

Fig. 14. a, *Vampyrum spectrum* (L.), RMNH, reg. no. 15909; b, *Tonatia carrikeri* (J. A. Allen), ZMB, Nr. 4334; c, *Micronycteris megalotis megalotis* (Gray), RMNH, reg. no. 17367; d, *Tonatia silvicola laephotis* Thomas, RMNH, reg. no. 15786.

calcar, so that it is not known at present whether the length of the calcar is really subject to such a great variation, or that the method of preservation is the cause of the different measurements found.

The skull of the Suriname specimen mentioned by Jentink (1887, p. 291)

under the name *Lophostoma bidens* Spix proves to belong to the present species; it consists of the rostrum and the damaged mandible only. It is unknown to me when and in which way the Leiden Museum acquired this skull of which the skin apparently never formed part of the collections. The few measurements which could be taken are: width across molars, 9.1; width across cingula canines, 5.5; upper tooth-row, 9.2; lower tooth-row, 10.2.

The Berlin Museum specimens of *Mimon bennettii* are too discoloured to permit any statement about the original colour. Dobson (1876, p. 492) noted: "Fur above cinnamon-brown, paler beneath; on both surfaces long and dense, covering the humerus, but scarcely extending to the membranes".

The present species is closely related to *Mimon cozumelae* Goldman, described from Cozumel Island, Yucatan, Mexico; according to Dalquest (1957a, p. 46) this species occurs also in Veracruz, Mexico, and almost certainly in Guatemala. This form is somewhat larger than *Mimon bennettii,* the mean length of the forearm of ten specimens being 54.9 mm; the colour is much paler while at the bases of the ears there are whitish areas. Far more material is needed, especially from the regions between the Guianas and Guatemala, to decide the question whether or not the two forms of *Mimon* intergrade; in this way a more correct idea of their relationship could be obtained (see also Handley, 1960, pp. 460-462).

According to Dalquest (1957a) *Mimon cozumelae* is a cave-dwelling bat that probably feeds on fruit and insects.

Anthorhina crenulata (E. Geoffroy)

(figs. 11d, 15b, 17b; pl. VII)

Phyllostoma crenulatum E. Geoffroy, 1810, Annales Mus. Hist. Nat., Paris, vol. 15, pp. 183-184; pl. 10: animal, ventral view; head, front view.

Tylostoma crenulatum, Dobson, 1878, Catalogue Chiroptera British Museum, p. 490.

? *Thylorhinna fumilis,* Kappler, 1881, Holländisch-Guiana, p. 163.

Type locality. — In the original description of the species Geoffroy (1810, p. 183) remarked: "Je n'ai trouvé aucun renseignement concernant la patrie de ces deux dernières espèces [= *Phyllostoma elongatum* and *Phyllostoma crenulatum*]: mais je ne crois pas pour cela me tromper en supposant qu'elles nous sont venues d'Amérique", while on page 184 in the synopsis of the genus *Phyllostoma* he noted: "Patrie. Inconnue; en Amérique vraisemblablement". Though Schinz (1821, p. 161) in "Das Thierreich" noted: "Vaterland Amerika?", he recorded in a later publication (1844, p. 235) without comment as locality of the present species: "Habitat in Brazil". Recently Cabrera (1958, p. 66) restricted the type locality to Bahía, Brazil.

As pointed out by Handley (1960, p. 462 footnote) this restriction "appears premature and perhaps detrimental". As far as known to me Dobson (1878, p. 490) was the first author who examined a specimen of the present species from a more precise locality, namely Suriname.

Distribution. — The present form occurs from eastern Venezuela and Trinidad, W.I., through the Guianas to the lower Amazon area. Vieira (1942, p. 300) considers a specimen from Bahía to belong to this form but, according to Handley (1960), the identification is uncertain.

Specimens examined.

Kaiserberg airstrip, Zuid Rivier, southwestern Suriname; October 18, 1960, H. A. Beatty; CNHM, no. 93208: male, dried skin and skull,

Suriname (probably coastal region); received in the Leiden Museum on October 15, 1910, P. Th. L. Grinnis Plaat; RMNH, reg. no. 12089: male, preserved in alcohol, skull extracted.

Description. — E. Geoffroy (1810, pp. 183-184; pl. 10: animal, ventral view; head, front view); Dobson (1878, pp. 489-490; 491: table; pl. xxv fig. 5: head, front view); Miller (1907a, pp. 129-130); Vieira (1942, pp. 299-300); Handley (1960, pp. 462-463); Goodwin & Greenhall (1961, pp. 236-237; fig. 38: head, front view; pl. 17 figs. 4-6: skull).

Length of forearm varying from (45) 48 to 51 mm; nose leaf about 17 mm long and 8 mm broad, the free margins of the erect portion more or less crenulate, fringed with fine straight hairs; ears large, rounded above, about 22 mm long and 17 mm broad; tragus narrow, acutely pointed, outer margin with prominent projections below; interfemoral membrane large, when expanded reaching to somewhat beyond the feet; calcar long, varying greatly in size (in specimen no. 12089 it is about three-fourths the length of the tibia, in the other specimen it is as long as the tibia); tail extending to about the middle of the interfemoral membrane, the tip perforating the membrane's dorsal surface; wing membrane from the side of the hind foot about halfway between the ankle and the base of the outer toe. Dorsally the soft fur consists of long dark greyish hairs with dark brown to blackish brown tips; an indistinct median line of white colour runs from the crown of the head to the tail; ventrally the tips of the hairs are light yellowish brown; the lip and chin are yellowish white.

Dental formula: $\frac{2.1.2.3}{1.1.2.3}$. Upper incisors completely filling the space between the canines; the height of the outer incisors is almost half that of the inner incisors, the tips of the latter diverge. First upper premolar as large as the outer upper incisors, crowded somewhat out of the tooth-row on the outer side, and touching the canine and the large second premolar; the latter is separated from the canine by a small space. Lower incisors with crowns

about as wide as high, and with faintly trifid cutting edges; the base of the first lower premolar about as long as that of the second. The audital bullae are large and swollen (see pl. VII); the sagittal crest is sharply defined, being highest on the top of the braincase.

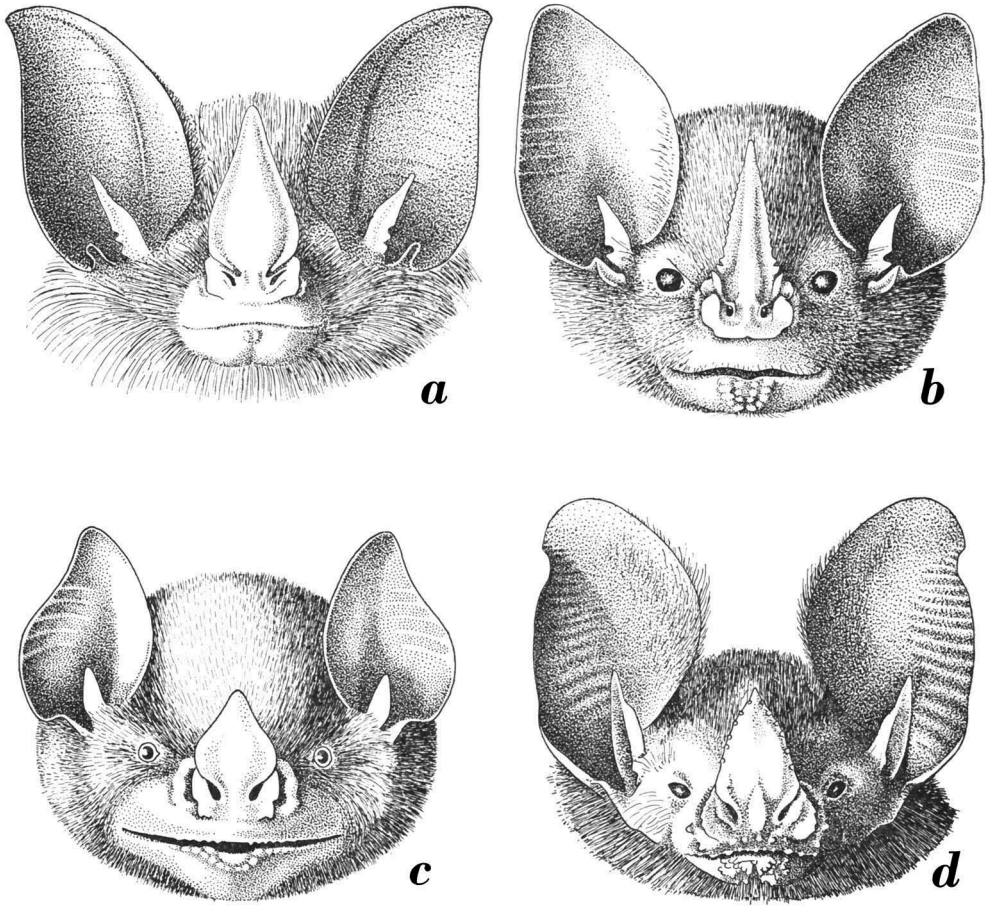

Fig. 15. a, *Mimon bennettii* (Gray), ZMB, Nr. 3350b; b, *Anthorhina crenulata* (E. Geoffroy), RMNH, reg. no. 12089; c, *Sturnira lilium lilium* (E. Geoffroy), SMN, Nr. 1064, 2; d, *Trachops cirrhosus cirrhosus* (Spix), RMNH, reg. no. 13217.

External (RMNH, reg. no. 12089) and skull measurements (RMNH, reg. no. 12089, and CNHM, no. 93208, respectively) of the two examined male specimens from Suriname; the lengths of the forearm and the ear of the Chicago Museum specimen were noted on the label to be 50 mm and 24 mm, respectively. Forearm, 49.9; length of third metacarpal, 47; first pha-

lanx, 15; second phalanx, 26; third phalanx, 17; length of fourth metacarpal, 45; first phalanx, 12; second phalanx, 15; length of fifth metacarpal, 46; first phalanx, 10; second phalanx, 13.5; ear, length × breadth, 22 × 17; tragus, 7.5; nose leaf, length × breadth, 17 × 8; tibia, 24; hind foot, 11; calcar, 18; free end of tail, 3. — Skull: greatest length, 22.0, 21.5; condylobasal length, 19.2, 19.1; condyle to front of canine, 19.0, 18.7; basal length, 17.4, 17.1; palatal length, 9.5, —; zygomatic breadth, 12.2, 12.7; breadth of braincase, 8.2, 8.4; height of braincase, without crest, 8.2, 7.8; mastoid breadth, 11.3, 11.0; postorbital constriction, 4.1, 4.1; width across molars, 8.7, 8.9; width across cingula canines, 5.4, 5.6; upper tooth-row, c-m^3, 7.8, 8.1; lower tooth-row, c-m_3, 8.6, 8.8; length of mandible, 14.3, 14.2.

Remarks. — Recently Handley (1960, p. 462) pointed to the variability of the crenulation and the hairiness of the nose leaf, and that of the length of the calcar as compared to that of the tibia. The two Suriname specimens, which in their skulls do not show any noticeable differences from each other, confirm Handley's statement. In the specimen from the Kaiserberg airstrip, which is preserved as a dried skin, the edges of the well fringed lancet seem to be straight, while the length of the calcar (about 22 mm) equals that of the tibia. In the other Suriname specimen, preserved in alcohol, the lancet is distinctly crenulate (see fig. 15b), the hairiness is less pronounced than in the Kaiserberg specimen, while the calcar is about three-fourths the length of the tibia.

The generic name *Anthorhina* was introduced by Lydekker (in Flower & Lydekker, 1891, p. 674, footnote 1) to replace the generic name *Tylostoma* Gervais, 1856, which is preoccupied by *Tylostoma* Sharpe, 1849. Lydekker did not give the derivation of the compound Greek names. Palmer (1904, p. 48) supposed the name *Anthorhina* to be derived from the Greek words ἄνθος (anthos: flower) and ῥίς (rhis: nose); it is also possible, however, that Lydekker had not in mind the Greek word ῥίς but ῥίνη (rhine: rasp, file) to indicate the crenulate structure of the upright portion of the nose leaf. Whatever the derivation of the name *Anthorhina* may be, it is certain that its gender is feminine. Article 30 (a) (3) of the 1961 Code (page 31) namely says: "If a genus-group name is a Greek word latinized with a change of termination, it takes the gender appropriate to that termination". Whether the name *Anthorhina* is derived from the Greek word "rhis" for nose or "rhine" for file, its latinization into "rhina" with the feminine ending -a makes it a feminine word. This gender was indeed assigned to it by Thomas (1903c, p. 457, 458) and Miller (1907a, p. 130), though Trouessart (1904, p. 112) and Vieira (1942, p. 299) considered it to be neuter.

Simpson (1945, p. 57) synonymized the genus *Anthorhina* with the genus

Mimon; Cabrera (1958, p. 66), and Goodwin & Greenhall (1961, p. 236) considered *Anthorhina* to be of subgeneric rank, while Handley (1960, p. 460) stated that "the nominal genera *Anthorhina* and *Mimon* are not distinguishable even as subgenera". In my opinion, however, the differences between *Mimon* and *Anthorhina,* so far as known at present, are of generic importance, since the characters as the relative size of the upper premolars, the height of the audital bullae, the shape and pubescence of the nose leaf, certainly are not of less importance than the characters which are used to distinguish other genera of the family Phyllostomidae. For this reason I consider, be it only provisionally, both genera to be distinct; no definite conclusion as to the status of these genera can be reached before the various species ascribed to them are better known. Notwithstanding Handley's (1960, pp. 462-463) conclusion that all described species of the genus *Anthorhina* must be considered subspecies of one single species, I regard these forms, at least for the time being, as good species; my reasons being the same as those which induce me to consider the genera *Mimon* and *Anthorhina* to be distinct. According to Handley the Guianas are inhabited by the typical form of *A. crenulata.*

Phyllostomus discolor discolor (Wagner)

(figs. 12e, 13b, 17c; pl. IX)

Phyllostoma discolor Wagner, 1843, Arch. Naturgesch., vol. 9, pt. 1, p. 366.
Phyllostoma discolor, Dobson, 1878, Catalogue Chiroptera British Museum, p. 487.
Phyllostoma discolor, Jentink, 1888, Mus. Hist. Nat. Pays-Bas, vol. 12, p. 206.

Type locality. — "Cuyaba", Matto Grosso, Brazil.

Distribution. — It is generally accepted by authors that the typical form of the present species occurs in South America from central Brazil and western Peru northward to Panama, Venezuela, Trinidad, and the Guianas. The second subspecies, *Ph. discolor verrucossus* (Elliot), originally described form southern Mexico, is said to occur from that region south into Panama.

Specimens examined.

Kaiserberg airstrip, Zuid Rivier, southwestern Suriname; October 12 and 22, 1960, H. A. Beatty; CNHM, nos. 93187, 93188 and 93189: male and two females, respectively; — November 7 and 25, 1960; nos. 93190 and 93191: female and male; — December 10 and 14, 1960; nos. 93192 and 93193: two males. All these specimens have been preserved as dried skins and skulls, with the exception of nos. 93190 and 93191, which are represented as dried skins only.

Suriname; date unknown, A. Kappler; ZMB, Nr. 3227a, b, c, and Nr. A 1838: four males, preserved in alcohol, damaged skulls extracted.

Suriname; date and collector unknown; RMNH, reg. no. 15903: male, preserved in alcohol, skull extracted (= Jentink's 1888 *Phyllostoma discolor,* no. a).

Description. — Wagner (1843, p. 366; 1847, pp. 167-168); Dobson (1878, p. 487; 488: table); Miller (1907a, pp. 130-131); Vieira (1942, pp. 280-281); Felten (1956a, pp. 186-189: *Ph. discolor verrucosus*; fig. 3: head, front view; pl. 25 figs. 4a-c: skull); Goodwin & Greenhall (1961, pp. 237-238; fig. 39: head, front view; pl. 19 figs. 4-6: skull).

Length of forearm varying from 55.4 to 66 mm; nose leaf well developed, about 13 mm long and 7 mm broad; ears relatively short and broad, shorter than the head, about 18 mm long and 12 mm broad; tragus small, about one-third the length of the ear; lower lip with a distinct V-shaped pad margined by small warts; interfemoral membrane well developed, when stretched reaching to the level of the ankles; calcar shorter than the hind foot, less than half the length of the tibia; tail about one-third the length of the interfemoral membrane, its tip appearing on the dorsal surface of that membrane; wing membranes from the ankles. Fur soft and dense, practically confined to the body, the ventral surface of the antebrachial membrane being loosely haired; dorsal surface of body dark to blackish brown, the basal parts of the hairs being whitish followed by a broad band of dark brown, while the extreme tips are greyish; colour of the ventral surface varying from cinnamon and pale brownish buff to dark greyish or silverish, paler on chest, the basal parts of the hairs are whitish, followed by a broad band of pale or greyish buff, the tips are silverish; wings dark to blackish brown. The males have a distinct gular glandular sac, which is rudimental in females.

Dentition: $\frac{2.1.2.3}{2.1.2.3}$. Upper incisors completely filling the space between the canines; outer incisors short and blunt, scarcely rising to the cingula of the canines and those of the inner incisors; inner incisors about as broad as high, their bases separated, the inner margins in contact from the middle to the tips; base of first upper premolar somewhat shorter than that of second, its shaft about half as high as that of the second; the last upper molar about one third the length of, but equal in breadth to the second. Lower incisors forming an arcuate continuous row between the canines, the outer slightly smaller than the inner, their cutting edges, if unworn, faintly trifid; the cingula of the two lower premolars about equal in length; the shaft of the first premolar broadly triangular, not so high as the narrow triangular shaft of the second premolar.

The external and skull measurements of ten examined specimens from Suriname are given in Table VIII.

Remarks. — The specimens of *Phyllostomus discolor* of the Berlin and the Leiden Museums are too bleached to permit of a description of the coat colour. The Kaiserberg specimens show no noticeable variation in the coat

TABLE VIII

External and skull measurements of ten specimens of *Phyllostomus discolor discolor* (Wagner) from Suriname.

Museum	CNHM	CNHM	CNHM	RMNH	ZMB	ZMB	ZMB	ZMB	CNHM	CNHM
Reg. number	93193	93192	93187	15903	3227a	3227b	3227c	A1838	93189	93188
Sex	♂	♂	♂	♂	♂	♂	♂	♂	♀	♀
Forearm	60	60	60	60.9	64.4	61.4	63.1	59.8	61	66
Third digit, metacarpal	—	—	—	56.5	61	58	57.5	56.5	—	—
1st phalanx	—	—	—	14.5	16	15	14	15	—	—
2nd phalanx	—	—	—	26.5	27	28	26.5	27	—	—
3rd phalanx	—	—	—	20	19	16	19	17.5	—	—
Fourth digit, metacarpal	—	—	—	55	59	55	55	54.5	—	—
1st phalanx	—	—	—	11.5	11	11.5	10	11.5	—	—
2nd phalanx	—	—	—	19	18.5	19	19	17.5	—	—
Fifth digit, metacarpal	—	—	—	54.5	59	55	54.5	53	—	—
1st phalanx	—	—	—	10	9	9.5	9.5	9.5	—	—
2nd phalanx	—	—	—	13.5	14.5	13	12	13.5	—	—
Tibia	—	—	—	22.5	25	24	22.5	22	—	—
Hind foot	—	—	—	14.5	16.5	14	14	14.5	—	—
Calcar	—	—	—	8.5	10	11	11	11	—	—
Depth of interfemoral membrane	—	—	—	23	27	25	23	28	—	—
Skull:										
greatest length	28.3	29.0	29.3	30.3	—	—	—	—	27.4	29.5
condylobasal length	25.0	26.3	26.7	—	—	—	—	—	25.3	27.3
condyle to front of canine	23.9	25.3	25.1	—	—	—	—	—	23.9	25.7
basal length	22.5	23.0	22.5	—	—	—	—	—	—	23.4
palatal length	13.4	12.8	12.8	14.2	—	13.1	13.1	—	—	13.1
zygomatic breadth	—	—	15.6	15.5	—	—	—	—	—	15.3
breadth of braincase	11.7	12.1	12.2	12.2	—	—	—	—	11.5	12.2
height of braincase	10.2	10.0	10.7	10.2	—	—	—	—	10.0	10.7
mastoid breadth	13.8	14.2	15.0	14.2	—	—	—	—	—	14.1
postorbital constriction	6.3	6.3	6.2	6.6	—	6.3	—	6.7	6.0	6.7
width across molars	9.4	—	9.9	10.3	10.4	10.2	9.6	10.0	9.5	10.0
width across cingula canines	6.8	7.3	7.2	7.4	7.5	7.3	7.2	7.0	6.3	7.2
upper tooth-row, c - m^3	9.1	9.4	9.2	9.5	9.8	9.4	9.6	9.5	9.2	9.8
lower tooth-row, c - m_3	10.4	10.5	10.3	10.7	10.8	10.7	10.8	10.6	10.3	10.8
length of mandible	18.2	19.0	19.2	19.3	20.1	19.6	19.1	19.1	18.1	19.4

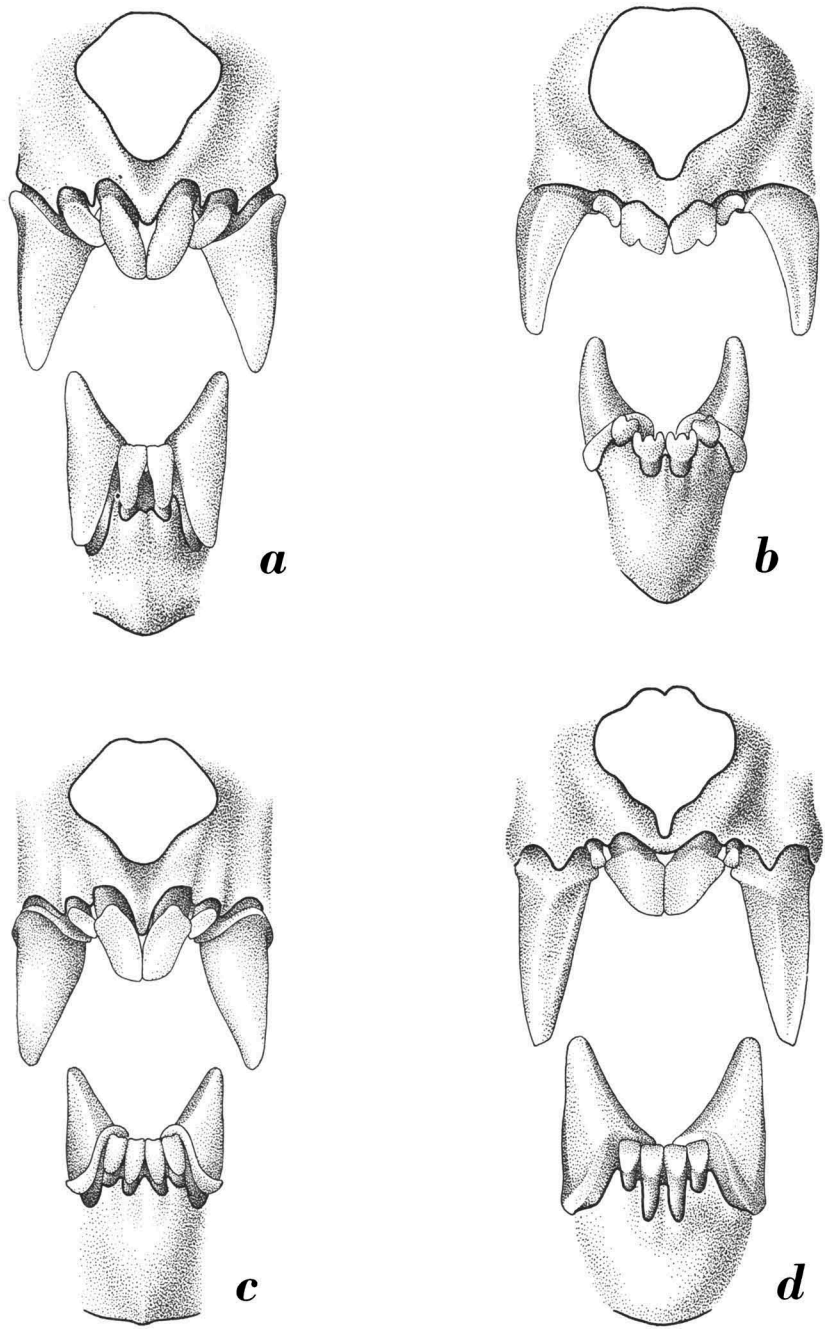

Fig. 16. Canines and incisors in front view. a, *Tonatia silvicola laephotis* Thomas, RMNH, reg. no. 15785; b, *Chilonycteris rubiginosa rubiginosa* Wagner, RMNH, reg. no. 16420; c, *Micronycteris megalotis megalotis* (Gray), RMNH, reg. no. 17295; d, *Trachops cirrhosus cirrhosus* (Spix), RMNH, reg. no. 13127. Width across cingula canines in mm: a, 5.8; b, 6.2; c, 3.3; d, 6.5.

colour of the dorsal surface, this being dark to blackish brown with a somewhat silverish tinge caused by the silver colour of the extreme tips of the hairs. The ventral surface of these specimens, however, shows several shades of dark greyish or silverish; the hairs are usually tricoloured as pointed out in the description. According to the data found in the literature the coat colour of the present species is subject to rather large variation: animals with a reddish brown dorsal surface and with the under parts washed with dirty yellowish brown have been reported. It is quite possible that such colour variants are also to be found in Suriname.

The external and skull measurements of the examined Suriname specimens of *Phyllostomus discolor discolor* agree rather well with those given by Sanborn (1936, p. 98), Dalquest (1951, p. 29), and Goodwin & Greenhall (1961, p. 238) for Venezuelan and Trinidad animals. When comparing these figures with those given by Felten (1956a, p. 188) for his *Ph. discolor verrucossus* from El Salvador, it appears that at least the dimensions of the skull of that subspecies on an average are slightly larger. Also the description of the coat colour given by Felten for the El Salvador form shows, that, as far as I can see, the two subspecies are only slightly different.

In the original description of his *Phyllostoma verrucossum* from Niltepec, Oaxaca, Mexico, Elliot (1905, p. 236) did not give a derivation of the specific name, which he used only once in his paper. It stands to reason that the spelling *verrucossum* (with double s) is a slip of the pen, the author apparently meaning to use the spelling *verrucosum*, the Latin word for warty. Subsequent authors as a rule therefore have used the spelling *verrucosum*. According to Article 32 (a) (ii) of the 1961 Code (page 35) the original spelling must remain unchanged if an inadvertent error cannot be proven. Since Elliot did not give the derivation of the specific name, it is not possible to prove that he made an error, and therefore the original spelling cannot be altered.

Phyllostomus elongatus (E. Geoffroy)

(figs. 11e, 13d; pl. X)

Phyllostoma elongatum E. Geoffroy, 1810, Annales Mus. Hist. Nat. Paris, vol. 15, pp. 182-183; 185; pl. 9.

Alectops ater Gray, 1866, Proc. Zool. Soc. London 1866, p. 144; figure: head, front view.

Phyllostoma elongatum, Dobson, 1878, Catalogue Chiroptera British Museum, pp. 487-488.

non *Phyllostoma elongatum*, Jentink, 1887, Mus. Hist. Nat. Pays-Bas, vol. 9, p. 291 (nos. a and b = *Phyllostomus hastatus hastatus* (Pallas); no. c = *Micronycteris megalotis megalotis* (Gray)).

non *Phyllostoma elongatum,* Jentink, 1888, Mus. Hist. Nat. Pays-Bas, vol. 12, p. 206 (= *Micronycteris megalotis megalotis* (Gray).

Type locality. — In the original description of the species Geoffroy (1810) did not mention a locality, but in the description of the following species, *Phyllostoma crenulatum,* on page 183 he noted: "Je n'ai trouvé aucun renseignement concernant la patrie de ces deux dernières espèces: mais je ne crois pas pour cela me tromper en supposant qu'elles nous sont venues d'Amérique"; in the synopsis of the genus *Phyllostoma* Geoffroy remarked on page 185: "Patrie. Inconnue; en Amérique, selon toute apparence". Wagner (1840, p. 396) remarked: "Die Heimat, welche Geoffroy nicht anzugeben wusste, ist Brasilien, woher Spix ein Exemplar mitbrachte". As far as known to me Peters (1865b, p. 519) was the first author who mentioned a more exact Brazilian locality, namely Rio Branco, Matto Grosso; he found this specimen in Natterer's collection in the Vienna Museum. Cabrera (1958, p. 67) considers therefore Rio Branco to be the restricted type locality of the present species.

The type locality of *Alectops ater* is "Surinam"; all authors follow Dobson (1878, p. 487) in synonymizing Geoffroy's and Gray's species.

Distribution. — The present species has been reported from Brazil, Peru, Ecuador, British Guiana, and Suriname.

Specimens examined.

Tempati, Tempati Creek, Commewijne River basin; August 25, 1961, K. H. Voous; ZMA, no. 4467: male, preserved in alcohol, skull extracted.

Paramaribo; date unknown, the Commission for the West Indian Exhibition at Haarlem, 1899; ZMA, no. 1648: male, preserved in alcohol, skull extracted.

Suriname; date unknown, A. Kappler; ZMB, Nr. 3217: female; Nr. 3359: male; Nr. 3985a and b: female and male, respectively. All these specimens are preserved in alcohol, skulls extracted.

Upper Berbice River, British Guiana; 1894-1895, C. G. Young; RMNH, reg. nos. 12093, 12102, 12106: three males; reg. nos. 12094-12101, 12103-12105, 12107-12110: fifteen females. All these specimens are preserved in alcohol, with the exception of the nos. 12103, 12105 and 12106, which are preserved as dried skins; all skulls have been extracted.

Description. — E. Geoffroy (1810, pp. 182-183; pl. 9: animal, left side view; head, front view); Tschudi (1844, p. 61); Gervais (1856, p. 47; pl. 7 fig. 3: head, front view; pl. 10 fig. 5: teeth, occlusal view; 5a: skull, right side view); Peters (1865b, pp. 516-519); Dobson (1878, pp. 487-488; pl. xxv fig. 4: head, left side view); Miller (1907a, pp. 130-131); Vieira (1942, pp. 281-283).

Length of forearm varying from 61.5 to 68.6 mm; nose leaf well developed, lanceolate, pointed, up to 18 mm long and 9 mm broad, usually with a pronounced central rib; ears large, rounded above, about 22 mm long and 16 mm broad; tragus short, about one-third the length of the ear; interfemoral

membrane broad, when stretched reaching to the ankles; calcar well developed, about 19 mm long, always distinctly longer than the hind foot; tail enclosed in the interfemoral membrane, perforating it in its basal part, the free tip (varying from 1 to 3 mm) projecting on the dorsal surface of this membrane; wing membranes from the ankles; gular sac distinct in the males, rudimentary in the females. Fur short and dense, practically restricted to the body, on the wings extending only on the dorsal and ventral sides of the proximal half of the upper arm; colour of the dorsal surface of the body dark reddish brown or dark blackish grey, the bases of the hairs more greyish, the extreme tips somewhat more light or yellowish brown; the colour of the ventral surface a shade lighter than that of the upper parts, because here a longer part of the tips of the hairs is yellowish brown or greyish; wings dark to blackish brown, the ends usually broadly tipped with white.

Dental formula: $\frac{2.1.2.3}{2.1.2.3}$. Upper incisors completely filling the space between the canines; the inner incisors much larger than the outer, the latter hardly attaining the level of the cingulum of the canine; first upper premolar smaller than the second, rising to about half the height of the latter, touching this tooth as well as the canine. Lower incisors about equal in size, forming a nearly straight continuous row between the canines; the outer incisor slightly wider than the inner, the cutting edges of both, if unworn, faintly trifid; the first lower premolar distinctly wider than the second, the shafts of both teeth are of about equal length and measure half the length of the canine.

The external and skull measurements of the examined specimens from Suriname are given in Table IX.

Remarks. — The measurements of the six Suriname specimens of *Phyllostomus elongatus* agree very well with those given by Sanborn (1951a, p. 7) for his Peruvian material, and with the lot of 18 specimens from British Guiana examined by me. It seems that the present species varies only slightly in the different parts of its area of distribution.

According to the collector's note the specimen from Tempati was caught with a nylon net in a dry forest.

Phyllostomus elongatus is closely related to *Ph. latifolius*, described by Thomas (1901d, pp. 142-143) from the Kanuku Mountains, British Guiana. Thomas's species seems to be very rare, since to my knowledge it is known from the type locality only. Therefore I provide here some data of the six paratypes which I received on loan from the authorities of the British Museum (Natural History). Some external and skull measurements are given in Table IX; of the specimens here dealt with, BMNH no. 1.6.4.155

TABLE IX

External and skull measurements of six specimens of *Phyllostomus elongatus* (E. Geoffroy) from Suriname and six paratypes of *Phyllostomus latifolius* Thomas from British Guiana.

	Phyllostomus elongatus						*Phyllostomus latifolius*					
Museum	ZMB	ZMB	ZMB	ZMB	ZMA	ZMA	BMNH	BMNH	BMNH	BMNH	BMNH	BMNH
Reg. number	3985a	3217	3985b	3359	1648	4467	1.6.4.155	1.6.4.40	1.6.4.41	1.6.4.42	1.6.4.44	1.6.4.45
Sex	♀	♀	♂	♂	♂	♂	♂	♂	♂	♂	♀	♀
Forearm	66.3	66.2	64.3	67.9	67.0	65.7	58	59	59	59	59.5	60
Third digit, metacarpal	58	60.5	56.5	61.5	61.5	61	54	55	53	54	53	55
1st phalanx	16.5	17.5	18	18.5	17	17.5	17	16.5	16	15	17	16
2nd phalanx	31	30	29	33	31.5	32	30	—	—	28	—	—
3rd phalanx	20	21	20	19	23	16	19	—	—	—	—	—
Fourth digit, metacarpal	57	59	55.5	61.5	60	59	53	52	51	52	52	53
1st phalanx	14	14	15.5	15.5	15	14	14	14.5	—	—	14	—
2nd phalanx	21	19	19	20	20	22.5	19	—	—	—	—	—
Fifth digit, metacarpal	57.5	60.5	57	63	61.5	61	55	53	53	54	54	54
1st phalanx	15	13	14.5	15.5	14.5	13.5	12.5	12.5	12	12	12	12
2nd phalanx	16	16	19	18.5	14.5	18	14.5	15	15	—	14	15
Tibia	27	27	26	27.5	28	27	22	22	22	21	22	23
Hind foot	16.5	16	17	—	16	16	14	14	15	15	15	14
Calcar	20	18	18	16.5	19	22	19	—	—	—	—	—
Skull:												
greatest length	28.6	29.3	28.3	29.7	30.0	30.1	—	27.2	27.1	27.7	27.3	27.5
condylobasal length	25.5	25.6	25.4	26.1	26.2	26.2	—	23.9	24.1	24.6	23.3	24.2
condyle to front of canine	24.9	25.0	24.6	25.4	25.8	25.3	—	—	—	—	—	—
basal length	—	22.8	22.2	23.0	22.8	—	—	21.4	21.8	21.6	20.8	21.2
palatal length	12.3	12.7	12.2	12.5	12.4	12.3	—	11.8	12.5	12.3	11.6	12.2
zygomatic breadth	—	16.5	15.9	16.9	16.9	16.7	—	15.3	—	15.8	—	15.1
breadth of braincase	11.0	10.9	11.3	11.1	11.3	11.3	—	10.5	10.1	10.5	10.4	10.3
height of braincase	10.3	10.2	10.8	10.4	11.0	11.1	—	9.7	9.1	10.0	9.6	9.6
mastoid breadth	13.0	14.1	14.5	14.5	14.8	14.6	—	13.6	13.6	13.8	13.5	13.7
postorbital constriction	5.6	5.6	5.4	5.5	5.6	5.8	—	4.8	4.5	5.0	4.9	5.1
width across molars	10.7	11.4	11.1	11.8	11.1	11.3	—	10.4	10.5	11.2	10.6	10.6
width across cingula canines	7.2	7.6	7.5	8.1	7.8	7.8	—	6.6	6.4	6.5	6.3	6.4
upper tooth-row, c - m^3	10.8	10.7	10.9	11.1	11.1	10.8	—	10.4	10.3	10.3	10.2	10.2
lower tooth-row, c - m_3	12.0	12.2	12.1	12.6	12.3	12.0	—	11.5	11.9	11.9	11.3	11.2
length of mandible	19.5	19.4	19.5	20.0	20.3	20.0	—	18.4	18.7	19.1	18.3	18.6
coronoid height	7.6	8.2	7.6	8.0	8.6	8.3	—	6.7	6.8	6.9	6.9	7.0

is in spirit, the rest are dried skins with folded wings. From the table appears that *Phyllostomus elongatus* is larger than *Ph. latifolius*: the length of the forearm of the former species varies from about 61 to 69 mm, of the latter from 58 to 60 mm, while the length of the tibia varies from 24 to 30 mm and from 21 to 23 mm, respectively. The skull measurements of *Ph. elongatus* are greater than those of *Ph. latifolius* in specimens of comparable age. However, not only absolutely but also relatively some dimensions of *Ph. elongatus* are larger than in *Ph. latifolius*; e.g., the ratio between the length of the forearm and the tibia is smaller in *Ph. elongatus* than in *Ph. latifolius*. The coronoid height of the mandible is not only absolutely but also relatively longer in *Ph. elongatus* than in *Ph. latifolius*, when compared with the length of the mandible.

Thomas (1901d, pp. 142-143) noted that the length of the nose leaf of *Ph. latifolius* exceeds that of *Ph. elongatus*, and that in the former species scarcely a trace of a central rib is visible, which is so distinct in the latter species. As far as I can see in the material of the two species at hand these characters are not of diagnostic value: (a) the length of the nose leaf in the two species is equal or the ranges overlap each other, while (b) the distinctness of the central rib of the lancet is subject to considerable variation in *Ph. elongatus*: in eight spirit specimens the rib is narrow and pronounced, in twelve broad and vague.

Phyllostomus hastatus hastatus (Pallas)

(figs. 11f, 13c; pl. IX)

V. (espertilio) hastatus Pallas, 1767, Spicilegia Zoologica, vol. 1, fasc. 3, p. 7.

? "Bat", Von Sack, 1810, Narrative of a voyage to Surinam, p. 254.

? "Groote Vledermuis", Von Sack, 1821, Reize naar Suriname, vol. 2, p. 213.

Vespertilio perspicillatus, Lammens, 1844, Isis 1844, pp. 107-108 (non *Vespertilio perspicillatus* L.).

Vespertilio hastatus, Lammens, 1844, Isis 1844, p. 108.

Phyllostoma hastatum, Kappler, 1881, Holländisch-Guiana, p. 163.

Phyllostoma hastatum (p.p.), Jentink, 1887, Mus. Hist. Nat. Pays-Bas, vol. 9, p. 291.

Artibeus perspicillatus (p.p.), Jentink, 1887, Mus. Hist. Nat. Pays-Bas, vol. 9, p. 292 (non *A. perspicillatus* (L.)).

Phyllostoma elongatum (p.p.), Jentink, 1887, Mus. Hist. Nat. Pays-Bas, vol. 9, p. 291 (non *Phyllostoma elongatum* E. Geoffroy).

Phyllostoma hastatum, Jentink, 1888, Mus. Hist. Nat. Pays-Bas, vol. 12, pp. 205-206.

Type locality. — Pallas (1767) based the name *Vespertilio hastatus* (without giving a description of the species) on De Buffon's (1765, pp. 226-228; pl. xxxiii) "Chauve-souris Fer-de-Lance". De Buffon stated on page 227: "..... au reste, cette espèce qui est fort commune en Amérique, ne se trouve

point en Europe". Later authors, like Schreber (1775, p. 161), Erxleben (1777, p. 136), and Zimmermann (1780, vol. 2, p. 410) mentioned South America as the region in which the species occurs. As far as known to me, E. Geoffroy (1810, p. 185) was the first author who indicated a more precise region, stating: "Patrie. La Guyane". J. A. Allen (1904, pp. 233-234) when describing two new subspecies of *Phyllostomus hastatus,* namely *Ph. hastatus panamensis* from Panama, and *Ph. hastatus caurae* from Colombia, gave as his opinion that De Buffon's animal originated from "the eastern coast of South America, probably 'Surinam', which may be considered as the type region of *P. hastatus* of modern authors". For this reason Suriname is the restricted type locality of the typical *Ph. hastatus.*

Distribution. — The present species occurs from the northeastern part of Honduras eastward through Central America to South America and the islands of Trinidad and Tobago; in South America it is found on the mainland southward to Peru, Bolivia, and S. E. Brazil (São Paulo). The typical form has been reported from Venezuela, Trinidad and Tobago, the Guianas, and Brazil. The distribution of the other subspecies is dealt with by Cabrera (1958, pp. 68-69); the systematic status and the exact range of the described subspecies, however, are differently interpreted by different authors.

Specimens examined.

Suriname; between 1824 and 1836, H. H. Dieperink; RMNH, reg. no. 15888: sex unknown, skeleton with damaged skull (= Jentink's 1887 *Phyllostoma hastatum,* no. c); reg. no. 15893: male, dried skin, skull inside (= Jentink's 1888 *Ph. hastatum,* no. d).

Suriname; 1844, A. Kappler; SMN, Nr. 240: male, preserved in alcohol, skull extracted.

Charlottenburg, Commewijne River, east of Paramaribo; 1861, Kraepelin and Holm; RMNH, reg. no. 15895: female, preserved in alcohol, skull extracted (= Jentink's 1888 *Ph. hastatum,* no. g).

Suriname; 1864, Steenbergen; RMNH, reg. no. 15894: male, preserved in alcohol, damaged skull extracted (= Jentink's 1888 *Ph. hastatum,* no. h).

Marowijne region; 1877, C. Schneider; RMNH, reg. no. 15883: male, skeleton (= Jentink's 1887 *Ph. hastatum,* no. a).

Paramaribo; February, 1888, J. H. Spitzly; RMNH, reg. nos. 15891 and 15892: two males, preserved in alcohol, skulls extracted (= Jentink's 1888 *Ph. hastatum,* nos. k and l).

Suriname; date and collector unknown; RMNH, reg. no. 15887: male, skeleton; reg. no. 15889: sex unknown, skull only; reg. no. 15890: sex unknown, strongly damaged skull only (= Jentink's 1887 *Ph. hastatum,* nos. b, d, and e, respectively).

Suriname; date and collector unknown; RMNH, reg. no. 15885: sex unknown, skeleton with damaged skull; reg. no. 15884: female, skeleton (= Jentink's 1887 *Ph. elongatum,* nos. a and b, respectively).

Suriname; date and collector unknown; RMNH, reg. no. 15886: skeleton (= Jentink's 1887 *Artibeus perspicillatus,* no. b).

Neighbourhood of Paramaribo; 1899, West Indian Exhibition; ZMA, nos. 1289 and 1650: two males, preserved in alcohol, skulls extracted.

Ma Retraite, Paramaribo; July 9, 1955, C. F. A. Bruijning; RMNH, reg. no. 17647: dried skin and strongly damaged skull.

Description. — De Buffon & Daubenton (1765, vol. 13, pp. 226-228; 229-232; pl. xxxiii: head, front view, and animal, left side view; see also the Dutch 1782 edition, vol. 13, pp. 158-162, pl. xxxiv); Dobson (1878, pp. 484-486; pl. xxv fig. 3: head, front view); Miller (1907a, pp. 130-131); Vieira (1942, pp. 276-279; fig. 9: animal, ventral view); Goodwin & Greenhall (1961, pp. 238-240; fig. 40: head, front view; fig. 41: nose leaf and lower lip; pl. 18 figs. 4-6: skull).

Length of forearm varying from 83 to 87.8 mm in seventeen specimens from Suriname; nose leaf well developed, about 18 mm long, lancet about 9 mm broad; ears about 27 mm long and about 17 mm broad, shorter than the head; tragus about one-third the length of the ear, subacutely pointed; interfemoral membrane large, when stretched reaching about to the toes; calcar about 23 mm, slightly longer than the hind foot, but distinctly shorter than the tibia (about two-thirds that length); tail short, about one-third the width of the interfemoral membrane, perforating it on its dorsal surface, the extreme tip of the tail free for about 3 mm; wing membrane from the ankles or slightly below them. Fur short, dense and velvety; dorsally the fur extends to the basal third of the forearm and on the interfemoral membrane to the zone of the tail; ventrally the antebrachial membrane is covered with buffy coloured hairs, while rather broad zones of hairs are found along the upper arm extending to the middle of the forearm and along the sides of the body. Two colour phases occur, a dark phase, which is between dark brown and black, and a more reddish phase varying from tawny to chestnut. In both phases the hairs of the dorsal surface of the body are unicoloured, those of the ventral surface have light tips so that the ventral surface is somewhat lighter than the dorsal. The wing membranes are blackish brown. A distinct gular sac is present in the males, it is much less distinct in the females.

Dental formula: $\frac{2.1.2.3}{2.1.2.3}$. Upper incisors completely filling the space between the canines; inner incisors touching each other in the middle, their bases separated by a small space, their tips diverging; outer incisors small, scarcely rising to the level of the indistinct cingulum of the canines and to that of the inner incisors; outer incisors touching both the inner incisors and the canines; first upper premolar smaller than the second, touching the canine as well as the second premolar; the shafts of the two premolars are short and thick, that of the second being about one-third longer than that of the first and about twice as high as either molar. Lower incisors forming a continuous, almost straight row between the canines, their cutting edges faintly trifid; the outer incisors are slightly higher than the inner, scarcely

rising to the cingulum of the canines; first lower premolar triangular with a broad base, about as high as the second premolar, touching that tooth as well as the canine; base of the second premolar distinctly shorter than that of the first, its height equals that of the first molar. The robust skull shows a distinct sagittal crest extending from the orbital region to the basioccipital bone, in males the height of this crest is up to 1.2 mm, in females up to 0.6 mm.

The external and skull measurements of ten specimens from Suriname are given in Table X.

Remarks. — *Phyllostomus hastatus hastatus* is, with the exception of *Vampyrum spectrum* (L.), the largest bat of Suriname. As pointed out on page 124 of the present paper, Stedman (1796, vol. 2, pp. 143-144; pl. 57 opposite p. 142) gave an inaccurate description and figures of the blood-sucking vampire bat, which actually may be based on *Phyllostomus hastatus*. Possibly Von Sack (1810, p. 254; 1821, vol. 2, p. 213) had *Ph. hastatus* in mind when describing besides *Vampyrum spectrum* a second large bat of Suriname (see citation on page 14), but his diagnosis is too short to permit a certain identification.

In his list of Suriname mammals, Lammens (1844, pp. 107-108) mentioned: "Nr. 856 [error pro 356]. Die Schaufelnase, Zimmermann p. 490.; *Vespertilio perspicillatus* Linne; — Fer de lance Buffon XIII. p. 119. t. 34.", and: "Nr. 357. Die Kleeblattnase, Zimmermann p. 491.; *Vespertilio hastatus* Erxl.; Chauve souris fer de lance Buffon XIII.; Javelin bat Pennant". Of Nr. 357 Lammens noted: "Zimmermann meynt, diese Fledermaus sey einerley mit der Schaufelnase; er unterscheidet sie nicht, gibt ihr jedoch einen andern Namen". This is not surprising since Buffon (1765, p. 226, footnote) in his remarks on "Chauve-souris Fer-de-Lance" referred not only to Seba's description and figure (1734, p. 90; pl. lv fig. 2) of "Vespertilio, Americanus, vulgaris" but also to Linnaeus's (1758, p. 31) *Vespertilio perspicillatus*, suggesting that his "Chauve-souris Fer-de-Lance" is identical with both species. The description which Lammens gave of "die Schaufelnase" is doubtlessly based on *Phyllostomus hastatus* and not on *Carollia perspicillata* (L.): "Diese Fledermaus ist 3¼″ lang, Flugweite 18, Schwanz sehr klein. Färbung braun oder vielmehr braunroth, welches ins Schwarze zieht. Kopf dick, Ohren behaart, breit nach oben zugespitzt; auf der Nase ein grosser Kamm, wie Lanzeneisen. Schwanz ¾″ lang, steckt ganz in der Flughaut und ragt nur 1 bis 2‴ vor. Sie pflegen sich des Abends zahlreich bey den Häusern zu versammeln, wenn Bäume in ihrer Nachbarschaft sind, und sie verbreiten einen sehr unangenehmen Geruch, welcher die Luft verpestet". Of "Nr. 357. Die Kleeblattnase" Lammens noted: "Ihre Länge ist 4″, Flugweite

TABLE X

External and skull measurements of ten specimens of *Phyllostomus hastatus hastatus* (Pallas) from Suriname.

Museum		RMNH	RMNH	ZMA	ZMA	RMNH	SMN	RMNH	RMNH	RMNH	RMNH
Reg. number		15891	15886	1650	1289	15883	240	15887	15892	15884	15895
Sex		♂	♂	♂	♂	♂	♂	♂	♂	♀	♀
Forearm		84.8	85	84.5	85.0	83	85.0	86	87.8	83	85.0
Third digit,	metacarpal	77	—	80	80	—	80	—	80.5	—	78
	1st phalanx	19	—	20	19.5	—	20	—	21	—	21
	2nd phalanx	37	—	40	39.5	—	38	—	39	—	38
	3rd phalanx	30	—	28	29	—	28	—	30	—	29
Fourth digit,	metacarpal	70	—	77	76	—	75	—	77.5	—	76
	1st phalanx	16	—	17.5	16	—	17	—	17	—	16
	2nd phalanx	26	—	28.5	28.5	—	27	—	29	—	27
Fifth digit,	metacarpal	70	—	76	75	—	75	—	76.5	—	75
	1st phalanx	15	—	17	16	—	16	—	16	—	16
	2nd phalanx	20	—	18.5	19	—	17	—	19	—	17
Tibia		33	—	31	31	—	31	—	30	—	31
Hind foot		19	—	21	20	—	21	—	21	—	20
Calcar		20	—	23	25	—	24	—	22	—	22
Skull:											
greatest length		36.2	36.8	37.1	37.2	37.5	37.7	38.7	38.8	35.0	36.3
condylobasal length		32.3	32.9	32.1	32.8	33.0	33.5	34.1	33.9	31.3	32.5
condyle to front of canine		31.1	31.7	31.5	32.1	31.8	32.4	33.0	33.0	30.4	31.8
basal length		28.5	29.3	29.9	29.6	30.2	30.1	30.5	30.3	28.0	29.2
palatal length		16.4	16.1	17.2	16.1	17.0	16.5	17.0	16.5	15.5	16.0
zygomatic breadth		20.4	20.5	21.2	21.5	21.0	—	21.8	20.6	—	19.3
breadth of braincase		14.0	14.3	14.1	14.4	14.5	14.0	14.6	14.1	13.6	13.8
height of braincase, without crest		12.2	13.1	13.8	12.8	13.1	12.5	12.9	12.7	12.1	12.7
mastoid breadth		18.9	20.2	19.9	20.5	19.9	20.2	20.4	20.2	17.9	18.5
postorbital constriction		7.1	7.1	7.2	6.9	6.9	7.2	7.5	7.3	7.2	7.3
width across molars		13.8	13.2	13.3	13.7	13.7	13.4	13.9	13.6	13.3	13.2
width across cingula canines		9.2	9.8	9.5	9.6	10.0	9.9	10.1	10.0	8.8	9.1
upper tooth-row, c - m^3		13.0	13.1	13.1	13.1	13.4	13.2	13.8	13.6	12.5	13.3
lower tooth-row, c - m_3		14.7	14.5	14.4	14.9	15.2	14.9	15.5	15.0	13.9	15.0
length of mandible		25.0	25.1	25.2	25.6	25.2	25.6	26.1	26.3	23.9	25.0

20, Schwanz sehr klein. Die Beschreibung der vorigen kann auch für diese gelten, ausser dass sie grösser ist, und die Färbung unvermischt schwarz". Since, however, two colour phases of *Phyllostomus hastatus* are known, one reddish brown, the other black, the characters used by Lammens for distinguishing his "Schaufelnase" from the "Kleeblattnase" are of no value.

In the literature no uniformity exists in the spelling of the name for this genus and in the use of the gender ascribed to it. G. Cuvier (1798, p. 105) used the French name "Phyllostomes" to indicate a section of the genus *Vespertilio,* containing among other species *V. hastatus.* Lacepède (1799, p. 16) erected a new genus *Phyllostomus* for *V. hastatus,* his name *Phyllostomus* evidently being a latinization of Cuvier's Phyllostomes. One year later Cuvier (1800) in table I at the end of the first volume of "Leçons d'Anatomie comparée" used the generic name *Phyllostoma* for those bats which he first gave the French name "Phyllostomes", this being the first use of the spelling *Phyllostoma* as the name of this genus. Though Cuvier in his 1800 paper gave no description of the genus *Phyllostoma,* this name cannot be considered a nomen nudum (see Opinion 39 of the International Commission on Zoological Nomenclature in Smithsonian Institution Publication 2060, February 1912, p. 91). Since the spelling of the first latin name given to this genus is *Phyllostomus* Lacepède, 1799, that spelling must be adopted as correct. Under Article 30 (a) (3) of the 1961 Code (page 31) the gender of *Phyllostomus* has to be treated as masculine. The name *Phyllostomus* Lacepède, 1799, has been placed on the Official List of Generic Names in Zoology as Name no. 411, while *Phyllostoma* Cuvier, 1800. is inserted in the Official Index of Rejected and Invalid Names in Zoology as Name no. 365.

Phylloderma stenops Peters

(figs. 12d, 17d; pl. X)

Phylloderma stenops Peters, 1865, Monatsber. Akad. Wiss. Berlin 1865, p. 513.
Guandira cayanensis Gray, 1866, Proc. Zool. Soc. London 1866, p. 114.

Type locality. — *Phylloderma stenops* and *Guandira cayanensis* have the same type locality: Cayenne, French Guiana.

Specimen examined.

Cayenne, French Guiana; date and collector unknown; RMNH, reg. no. 16843: holotype, male, dried skin, damaged skull (= Jentink's 1887 and 1888 *Phylloderma stenops,* no. a).

Description. — The original description of *Phylloderma stenops* as well as that of *Guandira cayanensis* is very short. The type of *Ph. stenops* has been more extensively described in a later paper by Peters (1866b, pp.

675-676), while Dobson (1878, p. 483; pl. xxiv fig. 6: canines, incisors) based his description of the present species on the type of *Guandira cayanensis*. A more detailed description of the skull and the teeth has been given by Miller (1907a, p. 131). In the original description of his *Phylloderma septentrionalis* from Honduras, which is larger than *Ph. stenops* (the length of the forearm of the type of *Ph. septentrionalis* is 80 mm instead of 70 and 67 mm in *Ph. stenops* and *G. cayanensis*, respectively), Goodwin (1940, p. 1) points to the differences between the two species (see also Goodwin, 1946, pp. 307-308; fig. 20: head).

Length of the forearm varying from 67 to 70 mm; nose leaf moderately developed, in the dried type specimen of *Ph. stenops* it is 13 mm long and 7.5 mm broad; ears broad, shorter than the head; tragus well developed, reaching to about the middle of the ear; interfemoral membrane wide, when expanded reaching to the ankles; calcar (about 16 mm) shorter than the foot, and about half as long as the tibia; tail short (about 16 mm), perforating the interfemoral membrane on the upper side; wing membrane from the side of the foot between the ankle and the base of the outer toe. Fur short and woolly, restricted to the body and the proximal half of the humerus above and beneath; upper parts dark brown, the bases of the hairs being dark brown, the tips bright yellowish-brown; under parts light greyish brown, the extreme basal part of the hairs light brown, the distal part whitish to light greyish.

Dental formula: $\frac{2.1.2.3}{2.1.3.3}$. Upper incisors completely filling the space between the canines; upper inner incisors bifid; upper outer incisors small, reaching to the cingulum of the canines; first upper premolar slightly smaller than the second, touching the latter tooth as well as the canine. Lower incisors forming a continuous semicircular row between the canines; lower inner incisors faintly bifid, nearly twice as wide as the outer, the cutting edges of which are straight; lower middle premolar very small, transversely wedged between the large first and third premolars, clearly seen in side view.

The following external measurements of the holotype of *Phylloderma stenops* are given by Peters (1866b, p. 676); to my knowledge skull measurements of the holotype have not been published before, some are given here. Forearm, 70; length of third metacarpal, 66; first phalanx, 24; second phalanx, 33; third phalanx, 23; length of fourth metacarpal, 65.5; first phalanx, 18; second phalanx, 25; length of fifth metacarpal, 67; first phalanx, 17; second phalanx, 18.5; length of head, about 28; nose leaf, length × breadth, 13 × 7.5; length of ear, 25; breadth of ear, 16; tragus, 10; length of tibia, 32; hind foot, 19; depth of interfemoral membrane, 35; calcar,

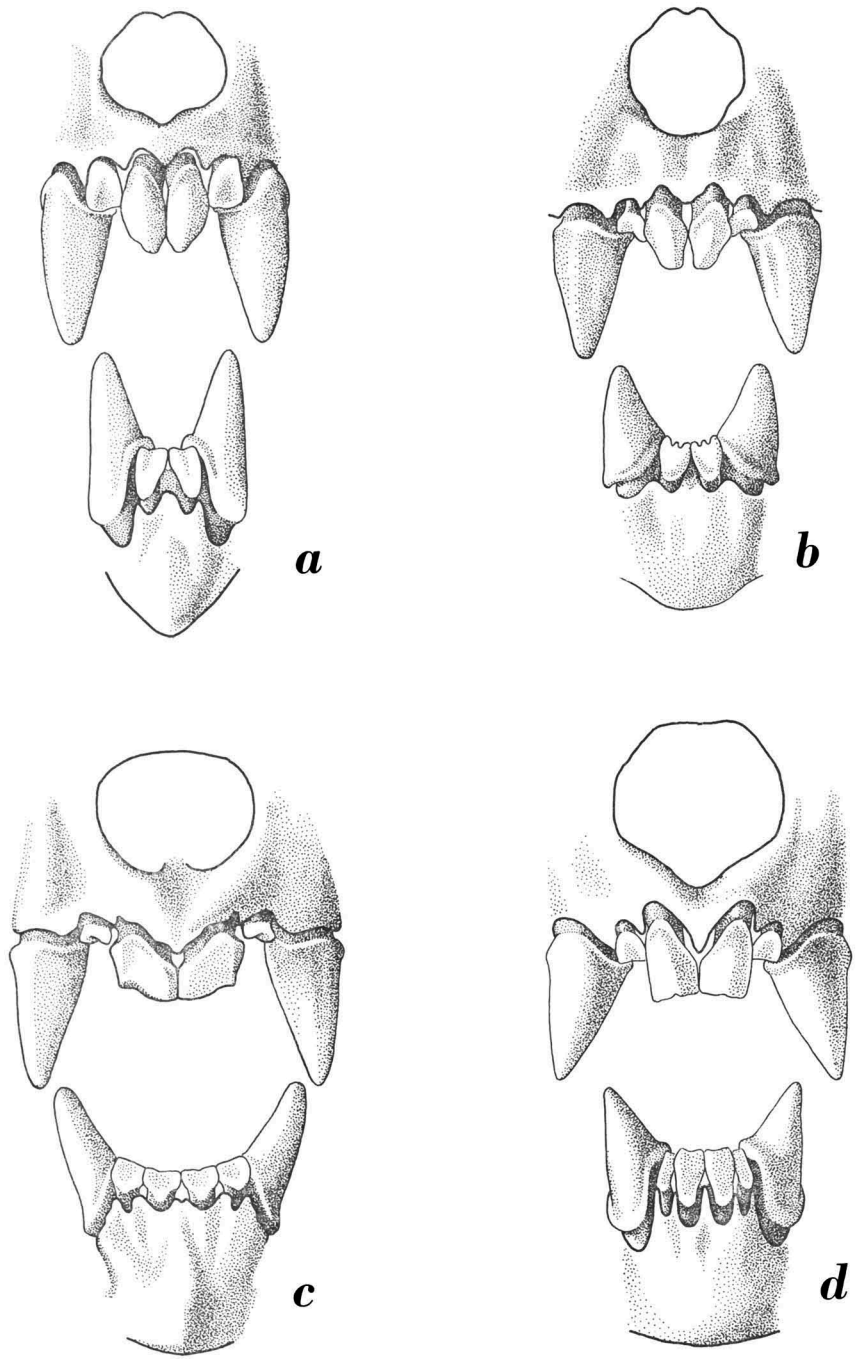

Fig. 17. Canines and incisors in front view. a, *Mimon bennettii* (Gray), ZMB, Nr. 3350b; b, *Anthorhina crenulata* (E. Geoffroy), RMNH, reg. no. 12089; c, *Phyllostomus discolor discolor* (Wagner), RMNH, reg. no. 15903; d, *Phylloderma stenops* Peters, RMNH, reg. no. 16843, holotype. Width across cingula canines in mm: a, 5.5; b, 5.4; c, 7.4; d, 5.9.

16; length of tail, 16. — Skull: palatal length, 12.7; zygomatic breadth, 14.5; breadth of braincase, 12.6; height of braincase, 12.3; interorbital constriction, 9.0; postorbital constriction, 8.3; width across molars, 9.4; width across cingula canines, 5.9; upper tooth-row, c-m^3, 9.8; lower tooth-row, c-m_3, 10.6; length of mandible, 19.3.

Remarks. — The stuffed skin of the type specimen of *Phylloderma stenops* is discoloured and somewhat damaged; the occipital region of the skull is lacking, and the mandible is broken. The external measurements given by Peters (1866b, p. 676), taken from the dried skin, prove to be correct. The distance between the occiput and the tip of the tail is about 105 mm; the distance between the occiput and the posteriormost margin of the stretched interfemoral membrane is about 120 mm.

In the original description of his new genus *Phylloderma,* Peters (1865, p. 512) remarked that the minute lower middle premolar, which is transversely wedged between the two functional premolars, is not visible in side view ("von aussen nicht sichtbar"); this minute premolar, however, standing perfectly in the tooth-row, can be clearly seen in side view. Dobson (1878, p. 483; pl. xxiv fig. 6), in the description of the teeth of the type of *Guandira cayanensis* noted that "the lower outer incisors are equal to the middle pair in vertical extent, but not half their diameter in cross section". In the type of *Ph. stenops,* however, the lower inner incisors are somewhat longer than the outer, while their cutting edges are hardly bifid; the inner upper incisors are distinctly bifid, the slender outer cusps being longer than the inner.

It is unknown when and in which way the Leiden Museum acquired the type of *Phylloderma stenops,* while also the collector is unknown. Though Jentink (1887, p. 291; 1888, p. 205) noted that the specimen is a "femelle à-peu-près adulte montée" (the indication "♀" is also found in pencil on the board), I agree with Peters (1866b, p. 676) that the animal apparently is a full-grown male; there is in the dried skin no indication of the presence of teats, while also the structure of the genital region points to a male. The specimen in question is too bleached to check whether or not the white tips on the wings and the light-coloured shoulder patches, which Goodwin (1940, p. 1) observed in *Phylloderma septentrionalis* from Honduras, are present in *Ph. stenops.*

The external characters of *Phylloderma stenops* are essentially similar to those of *Phyllostomus.* Taking into account the length of the forearm, *Phylloderma stenops* is of about the same size as *Phyllostomus elongatus.* In the latter species, however, the calcar is longer than the foot, while in *Phylloderma stenops* the calcar (about 16 mm) is shorter than the foot (about 19

mm). In the examined specimens of *Phyllostomus elongatus* the length of the first phalanx of the third finger is less than 20 mm, while in the two specimens of *Phylloderma stenops* this length is 21.6 and 24 mm.

The type locality of this apparently very rare bat makes it probable that *Phylloderma* also occurs in Suriname.

Trachops cirrhosus cirrhosus (Spix)

(figs. 11g, 15d, 16d; pl. VIII)

Vampyrus cirrhosus Spix, 1823, Simiarum et Vespertilionum Brasiliensium species novae, pp. 64-65, pl. xxxvi fig. 3.

Type locality. — In the original description of this species, Spix (1823) did not mention a precise locality, as he did for several other Brazilian bats. Since Spix noted on page 53: "In itinere, quod per Brasiliam a vigesimo quarto latitudinis gradu usque ad Aequatorem una cum viro amicissimo Dr. Martio peregi, conquirendorum animalium occasionem opportunam nactus, etiam vespertiliones non paucos collegi, mecumque in patriam reportavi.", his *Vampyrus cirrhosus* originated most probably from that region of Brazil. Probably for this reason Schinz (1844, p. 235) gave as locality: "Habitat in Brasiliae provincia Para". In 1847, however, Gray described *Trachops fuliginosus* as the type of his new genus *Trachops,* noting on page 14 that "*Vampyris cirrhosum,* Spix, Vesp. Braz. t. xxvi. f. 3, evidently belongs to the same genus, if indeed it is distinct from the species above noticed" [= *Trachops fuliginosus*]. Gray based his description on two females from Pernambuco. Later authors placed *T. fuliginosus* in the synonymy of *T. cirrhosus,* some of them at the same time considering Pernambuco to be also the type locality of Spix's species. This procedure is, however, incorrect, Schinz's indication of the type locality having priority. Consequently the restricted type locality is Para, Brazil.

Distribution. — The species *Trachops cirrhosus* has a wide distribution, which extends from southern Brazil north to the southernmost part of Mexico. In the southern part of Brazil it is represented by the subspecies *T. cirrhosus ehrhardti,* recently described by Felten (1956b, p. 369) from Joinville, Santa Catharina, Brazil. In Central America the subspecies *T. cirrhosus coffini* is found, originally described by Goldman (1925) from Guatemala as a distinct species (for the correct type locality see De la Torre, 1956). In the remaining regions (North Brazil, Colombia, the Guianas, Venezuela, and Panama) the typical form occurs, which in all its dimensions is somewhat larger than the two other forms.

Specimen examined.

Coropina Kreek, between Zanderij and Republiek; September 4, 1948, Suriname Expedition 1948/1949; RMNH, reg. no. 13127; adult male, preserved in alcohol, skull extracted.

Description. — Spix (1823, pp. 64-65); Dobson (1878, pp. 481-482; pl. xxv fig. 2: head, front view; pl. xxvi figs. 4, 4a and 4b: skull and tooth-rows); Miller (1907a, pp. 132-133); Vieira (1942, pp. 283-286; fig. 10: animal, ventral view); Goodwin & Greenhall (1961, pp. 240-242; fig. 42: head, front view; fig. 43: nose leaf and chin, front view; pl. 19 figs. 1-3: skull). A detailed description of *Trachops cirrhosus coffini* has been given by Felten (1956a, pp. 189-191; fig. 4: head, front view; pl. 25 fig. 5a-c: skull).

Length of forearm varying from 58 to 64.2 mm; nose leaf ovate-lanceolate, about 12 mm long and 8 mm broad, the margins of the lancet being finely toothed; ears large and broad, up to 29 mm in length; tragus about one-third the ear length; lips conspicuously studded with small conical wart-like protuberances becoming fewer in number and smaller towards the angle of the mouth; interfemoral membrane extending to about the ankles; calcar about half the length of or slightly shorter than the tibia; tail enclosed in the membrane, the tip appearing on its dorsal surface, about as long as the calcar; wing membranes from the proximal end of the ankles. Upper parts chestnut to dark reddish brown, under parts more greyish.

Dental formula: $\frac{2.1.2.3}{2.1.3.3}$. Outer upper incisors minute, their cutting edges not reaching to the cingulum of the canines. The second lower premolar very minute (smaller than the minute outer upper incisors), completely crowded out of the tooth-row on the inner side, invisible from the outer side, the two functional premolars being almost in contact.

External and skull measurements of the examined adult male from Suriname. Forearm, 64.2; length of third metacarpal, 54; first phalanx, 23; second phalanx, 34; third phalanx, 19; length of fourth metacarpal, 55; first phalanx, 19; second phalanx, 21; length of fifth metacarpal, 59; first phalanx, 19; second phalanx, 21; length of ear, 28; breadth of ear, 18.5; tibia, 31; hind foot, 17; calcar, 12; tail, 16; nose leaf, length, 12; nose leaf, breadth, 8. — Skull: greatest length, 29.8; condylobasal length, 27.2; condyle to front of canine, 26.6; basal length, 24.5; palatal length, 13.8; zygomatic breadth, 15.7; breadth of braincase, 12.1; height of braincase, 12.0; mastoid breadth, 13.9; postorbital constriction, 5.5; width across molars, 10.8; width across cingula canines, 6.5; upper tooth-row, c-m^3, 10.9; lower tooth-row, c-m_3, 11.8; length of mandible, 20.5.

Remarks. — The most striking characters of *Trachops cirrhosus* are (1)

the finely toothed margins of the lancet of the nose leaf, and (2) the lips which are studded with small cylindrical wart-like protuberances.

The adult Suriname male specimen has a large glandular sac. When comparing the measurements with those given by Hershkovitz (1949, p. 438), based on 20 specimens from Colombia, it appears that the Suriname specimen is very large (see also Felten, 1956b, p. 369): in the series examined by Hershkovitz the maximum value of the length of the forearm and of that of the third metacarpal are 63.1 and 51.5 mm, respectively, while in the specimen from Suriname these values are 64.2 and 54 mm, respectively. The length of the ear was noted by Hershkovitz as 34-39 mm, this may be a misprint for 24-29 mm. The skull measurements given by this author agree very well with those of the Suriname specimen.

In the original description of *Trachops coffini* from Guatemala, Goldman (1925, p. 24) noted "face of upper incisors with a broad, open groove leading to a distinct notch in the cutting edge (rather faintly indicated in *cirrhosus*)". As pointed out by Felten (1956a, p. 191) this skull character has probably no diagnostic value, as it may be dependent on the age of the individual. As far as I can see this groove is entirely lacking in the examined Suriname specimen.

Cabrera (1958, p. 69) treated the generic name *Trachops* as feminine. According to the 1961 Code (Article 30 (a) (i) (2), Examples, page 31), however, the name is definitely masculine.

Vampyrum spectrum (Linnaeus)

(figs. 11h, 14a, 18a; pls. I, XI)

"Bats" (p.p.), Warren, 1667, Description of Surinam, pp. 21-22.

"Vleder-muysen" (p.p.), Warren, 1669, Beschrijvinge van Surinam, p. 17.

"Vledermuizen" (p.p.), Van Berkel, 1695, Amerikaansche Voyagien, p. 129.

"Vledermuizen" (p.p.), Herlein, 1718, Volk-Plantinge Zuriname, p. 178.

Vespertilio Spectrum Linnaeus, 1758, Systema naturae, ed. 10, vol. 1, p. 31.

"Vledermuizen" (p.p.), Pistorius, 1763, Beschryvinge van de Colonie Zuriname, p. 73.

Vespertilio Cynocephalus, Maximus, Auritus, facie Canina, Fermin, 1765, Hist. nat. Hollande équinoxiale, p. 8.

"Grandes Chauves-Souris" (p.p.), Fermin, 1769, Description de la Colonie de Surinam, vol. 2, pp. 139-140.

"Bats of Guiana" (p.p.), Bancroft, 1769, Natural History of Guiana, pp. 146-147.

"Groote Vleder-Muisen" (p.p.), Fermin, 1770, Beschryving van de Colonie van Suriname, vol. 2. pp. 120-121.

"Groote Vledermuizen, genaamd vliegende Honden of Katten" (p.p.), Hartsinck, 1770, Beschryving van Guiana, vol. 1, p. 98.

"Vledermuizen van Guiana" (p.p.), Bancroft, 1782, Natuurlyke Geschiedenis van Guiana, pp. 115-116.

"Vampire or spectre of Guiana" (p.p.), Stedman, 1796, Narrative Revolted Negroes of Surinam, vol. 2, pp. 142-144, pl. 57; pp. 170 and 205.

"Vampire" (p.p.), Von Sack, 1810, Narrative of a voyage to Surinam, p. 153 footnote.
"Vampyrs" (p.p.), Von Sack, 1821, Reize naar Suriname, vol. 1, p. 207 footnote.
"Vampyrs" (p.p.), Teenstra, 1835, Landbouw in Suriname, vol. 2, pp. 416-417.
"Vampire" (p.p.), Benoit, 1839, Voyage à Surinam, p. 54, pl. xxxii fig. 67.
Vespertilio vampyrus, Lammens, 1844, Isis 1844, p. 107 (non *Vespertilio vampyrus* Linnaeus).
Non *Vespertilio spectrum,* Lammens, 1844, Isis 1844, p. 107 [= *Artibeus lituratus fallax* Peters].
"Groote Vledermuizen of vampyrs", Copijn, 1858, West-Indië, vol. 2, p. 13.
Vampyrus spectrum, Kappler, 1881, Holländisch-Guiana, p. 163.
Vampyrus spectrum, Jentink, 1887, Mus. Hist. Nat. Pays-Bas, vol. 9, p. 290; 1888, vol. 12, p. 205.

Type locality. — "America australi". Restricted by Thomas (1911a, p. 130) to Suriname.

Distribution. — Mexico (Vera Cruz), Nicaragua, Costa Rica, Panama, Venezuela, Trinidad, W.I., the Guianas, Ecuador, Peru, north and central Brazil; Dobson (1878, p. 471) reported the species from Jamaica, W.I.

Specimens examined.

Paramaribo; 1888, J. H. Spitzly; RMNH, reg. no. 15911: male, preserved in alcohol, skull extracted (= Jentink's 1888 *Vampyrus spectrum,* no. f).
Suriname; between 1824 and 1836, H. H. Dieperink; RMNH, reg. no. 15908: male, dried skin and skull (= Jentink's 1888 *V. spectrum,* no. c).
Suriname; between 1824 and 1836, H. H. Dieperink; RMNH, reg. no. 15914: skull only, sex unknown (= Jentink's 1887 *V. spectrum,* no. b).
Suriname; 1877, A. Kappler; SMN, Nr. 1631: female, preserved in alcohol, skull extracted.
Suriname; date unknown, Van Horn; RMNH, reg. no. 15909: female, preserved in alcohol, skull extracted (= Jentink's 1888 *V. spectrum,* no. d).
Suriname; date and collector unknown; RMNH, reg. no. 15913: skeleton, sex unknown (= Jentink's 1887 *V. spectrum,* no. a).
Suriname; date and collector unknown; RMNH, reg. no. 15910: male, preserved in alcohol, damaged skull extracted (= Jentink's 1888 *V. spectrum,* no. e).
Plantation Friends Hospital, Berbice, New Amsterdam, British Guiana; December 1899, C. G. Young; RMNH, reg. no. 12115: male, preserved in alcohol, skull extracted.
French Guiana; date and collector unknown; RMNH, reg. no. 15906: male, dried skin, damaged skull extracted (= Jentink's 1888 *V. spectrum,* no. a).
French Guiana; date and collector unknown; RMNH, reg. no. 15907: female, dried skin only (= Jentink's 1888 *V. spectrum,* no. b).

Description. — E. Geoffroy (1810, pp. 174-175; pl. 11: head, front view; skull, left side view; canines and incisors, front view); Dobson (1878, pp. 470-471; pl. xxiv fig. 3: skull, ventral view; fig. 3a: c-p^2, right side view); Miller (1907a, pp. 134-135; pl. 1 fig. 3: right upper tooth-row, occlusal view; pl. ii fig. 3: right lower tooth-row, occlusal view); Vieira (1942, pp. 286-288; fig. 11: head and skull as figured by E. Geoffroy, 1810); Goodwin & Greenhall (1961, pp. 242-243; fig. 44: head, left side view; pl. 18 figs. 1-3: skull).

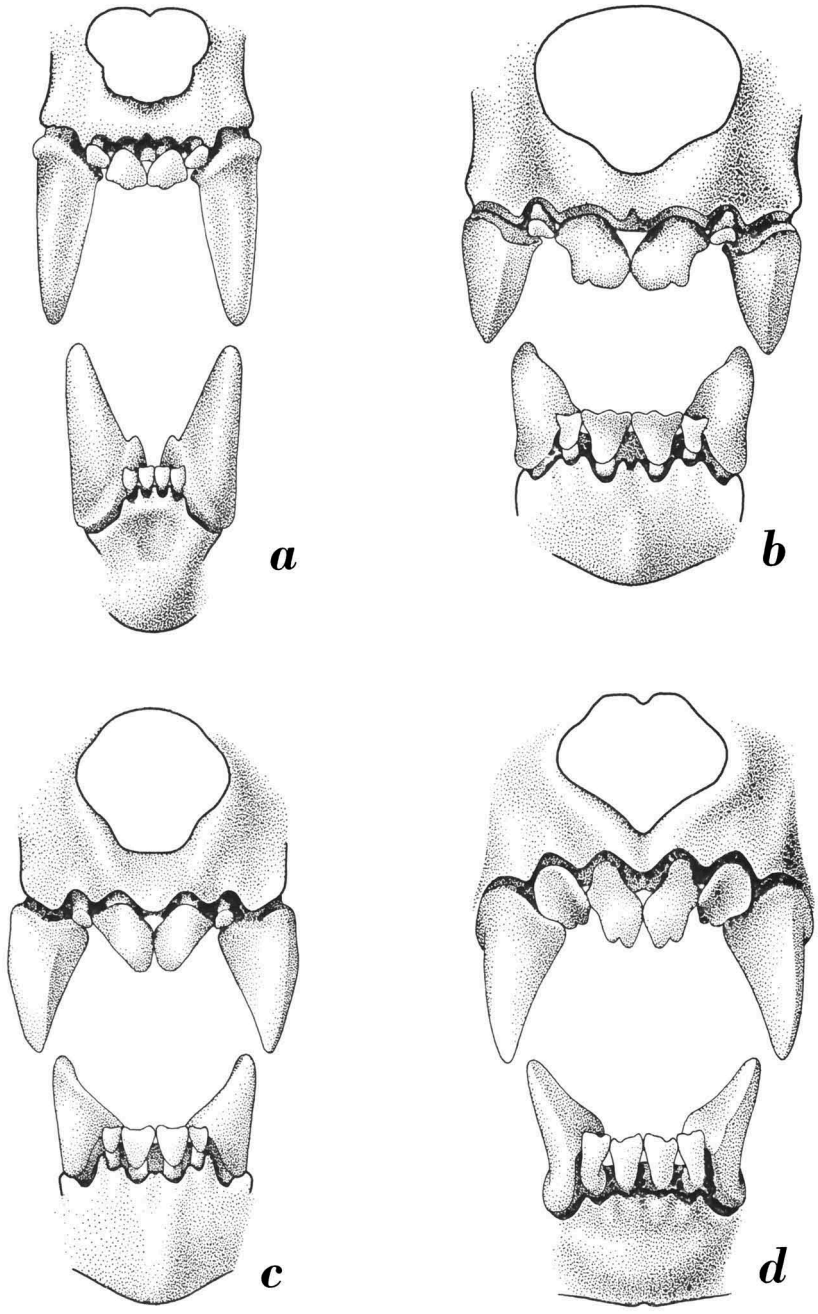

Fig. 18. Canines and incisors in front view. a, *Vampyrum spectrum* (L.), SMN, Nr. 1631; b, *Rhinophylla pumilio* Peters, RMNH, reg. no. 12510; c, *Carollia perspicillata perspicillata* (L.), RMNH, reg. no. 17565; d, *Sturnira lilium lilium* (E. Geoffroy), SMN, Nr. 1064, 1. Width across cingula canines in mm: a, 9.8; b, 4.6; c, 4.9; d, 6.3.

Length of forearm varying from 100 to 113.3 mm; nose leaf well developed, about 18 mm long and 11 mm broad; ears large and broad, up to 40 mm in length and 26 mm in breadth; tragus small; interfemoral membrane large, when expanded reaching to the toes; calcar more than half the length of the tibia, and always somewhat larger than the foot; no external tail; wing membranes from the basal third of the outer toes. Fur dorsally rather long and soft, ventrally short, extending to the middle of the forearm; upper parts reddish brown, the basal part of the hairs being reddish yellow, the terminal part reddish brown; under parts uniformly light reddish yellow or yellowish.

Dental formula: $\frac{2.1.2.3}{2.1.3.3}$. The most striking skull characters are (1) the large canines, which are relatively much larger than those of other Phyllostomidae, and (2) the width of the molars, greater than that of the palate.

The external and skull measurements of the ten examined specimens from the Guianas are given in Table XI.

Remarks. — Linnaeus (1758, p. 31) based his *Vespertilio Spectrum* on Seba's (1734, vol. 1, pp. 92-93; pl. lviii fig. 1; see pl. I in the present paper) description and plate of "Canis volans, maxima, aurita". Seba's French description runs as follows: "No. 1. Chienne qui vole, de la Nouvelle Espagne, très-grande, & portant de longues oreilles. Nous l'avons reçue de Terra Nova, où cette espece d'animaux habite les lieux deserts, & en particulier les vieux arbres rongés par le tems. Elle a la tête oblongue, les oreilles longues, larges, dressées, le museau ample garni de grandes dents, le nez situé au dessus & recourbé en avant semblable à une corne. Ses aîles sont faites comme celles du Chien de la Planche précedente, mais plus grandes & plus larges. Les tendons qui servent à les étendre paroissent mieux ici, ils ressemblent aux fibres cotonneuses d'un arbrisseau, ou aux petits vaisseaux qui sont distribués sous la peau de l'homme, car c'est de la même maniere qu'ils sont répandus par toute la superficie interne du tissu des aîles. Elle porte aussi des tettes garnies de mammelons, & n'a point de queuë. Mais à l'endroit de son origine, il sort de l'extremité du derriere du corps, entre les cuisses, trois tendons, dont les deux lateraux s'inserent de chaque côté dans le pied de derriere, & le tendon du milieu partage le tissu membraneux qui joint ensemble les pieds de derriere, & par-là aide au vol de cet animal. Au reste cette Bête est extremement rare, & jusqu'à present je ne l'ai pu trouver dans aucun Cabinet des amateurs en ce genre".

The synonomy of the present species was dealt with by Sanborn (1949b, p. 280). Goldman (1917, pp. 115-116) described a subspecies *V. spectrum nelsoni* from Coatzacoalcos, Vera Cruz, Mexico, and reported this subspecies

TABLE XI

External and skull measurements of ten specimens of *Vampyrum spectrum* (L.) from the Guianas.

Locality	Suriname	Suriname	Suriname	British G.	French G.	Suriname	Suriname	French G.	Suriname	Suriname
Museum	RMNH	RMNH	RMNH	RMNH	RMNH	RMNH	SMN	RMNH	RMNH	RMNH
Reg. number	15911	15908	15910	12115	15906	15909	1631	15907	15914	15913
Sex	♂	♂	♂	♂	♂	♀	♀	♀	?	?
Forearm	103.5	104	104	103	100	106	101	100	—	—
Third digit, metacarpal	78	78	78	72	71	76.5	73	72	—	—
1st phalanx	42	40	42	42	41	41	41	40	—	—
2nd phalanx	48	46	48	48	47	49	48.5	45	—	—
3rd phalanx	41	37	40	36	35	41	33	37	—	—
Fourth digit, metacarpal	82	83	85	80	80	82	79.5	78	—	—
1st phalanx	33.5	32	32	32	31	31	32	32	—	—
2nd phalanx	39	35	38.5	34	32	39	37	32	—	—
Fifth digit, metacarpal	89	91	91.5	89	86	90.5	87	85	—	—
1st phalanx	32.5	31	31	32	30	30	30	30	—	—
2nd phalanx	38	35	38	35	30	40	34	32	—	—
Ear, length × breadth	40 × 25.5	—	37 × 25	35 × 23.5	30 × 21	39 × 27	35 × 26	—	—	—
Tibia	56	51	53	53	51	56	53	50	—	—
Hind foot	30	29	31	30	30	31	29	—	—	—
Calcar	36	30	35	32	31	36.5	33	32	—	—
Nose leaf, length × breadth	16 × 11	—	18.5 × 12.5	—	—	18 × 10.5	16 × 10	—	—	—
Skull:										
greatest length	51.0	51.1	—	51.0	52.1	51.7	49.2	—	50.1	52.2
condylobasal length	42.8	44.0	—	43.9	—	43.3	41.6	—	43.2	43.8
condyle to front of canine	42.6	43.7	—	43.7	—	43.2	41.8	—	43.0	43.7
basal length	38.2	—	—	40.4	—	39.1	37.9	—	37.7	39.1
palatal length	24.3	24.6	—	26.1	—	25.0	24.8	—	23.7	25.3
zygomatic breadth	23.4	23.2	—	24.7	—	23.8	23.7	—	23.8	24.9
breadth of braincase	15.8	16.1	—	16.5	—	15.8	15.9	—	16.0	16.3
height of braincase, without crest	15.5	15.2	—	16.2	—	16.4	15.6	—	16.2	16.2
mastoid width	21.5	21.5	—	22.9	—	21.3	20.5	—	21.2	21.5
postorbital constriction	7.3	7.7	—	8.0	7.4	7.9	7.9	—	8.0	8.6
width across molars	15.0	15.0	—	15.1	14.5	14.7	15.0	—	14.6	15.2
width across cingula canines	9.4	9.1	9.3	9.4	9.4	8.8	9.8	—	9.2	9.4
upper tooth-row, c - m^3	20.6	21.2	20.6	21.4	21.2	20.8	20.8	—	20.3	21.2
lower tooth-row, c - m_3	23.0	23.1	23.0	23.8	23.6	22.4	23.1	—	22.4	23.6
length of mandible	35.7	36.3	35.6	36.5	37.2	36.0	34.7	—	35.3	37.1

also from Nicaragua and Panama. According to Goldman the length of the forearm and the dimensions of the skull in *V. spectrum nelsoni* are "rather decidedly smaller" than in the typical *Vampyrum spectrum*. As appears from the measurements given in table XI of the present paper and from those given by Goldman and by Goodwin (1946, p. 310) for *V. spectrum nelsoni*, the latter fall entirely within the range of variation of the topotypical Surinam specimens of *V. spectrum*. Sanborn (1941, p. 374) gave the measurements of an exceptionally large specimen from Trinidad, of which the forearm measures 113.3 mm. Since I did not examine any material from Central America I cannot decide whether or not the other skull characters and "especially the reduction of hypocone of posterior upper premolar", mentioned by Goldman, are of subspecific value, but it is very improbable that this character should be of diagnostic value. For this reason I cannot consider *V. spectrum nelsoni* to be an independent subspecies. Sanborn (1949b, p. 281) already recognised *V. spectrum* as a single species without geographical races. Miller & Kellogg (1955, p. 68), Cabrera (1958, p. 70), and Hall & Kelson (1959, p. 112; fig. 72: skull), however, maintain *V. spectrum nelsoni* as a good subspecies.

The name of the present genus has often been given as *Vampyrus* Leach, 1822. Andersen (1908a, p. 433) correctly pointed out that the name *Vampyrum* Rafinesque, 1815, for this genus, is older and that it therefore has to be used. Rafinesque's name probably has been ignored by many authors because they considered it to be a nomen nudum. It even is inserted as such in Neave's Nomenclator Zoologicus (1940, vol. 4, p. 627). However, as Andersen has clearly demonstrated, *Vampyrum* Rafinesque certainly is not a nomen nudum, though Rafinesque's description is extremely short. According to Neave's Nomenclator *Vampyrus* Leach, 1822, is preoccupied by *Vampyrus* Ranzani, 1820, and also for that reason cannot be used for the present genus.

Occurrence in Suriname. — *Vampyrum spectrum* has been reported from Suriname in many of the ancient narratives. In these old accounts it is generally stated that the species does suck blood from man and animals; though the description given of the species, judging by the size indicated, clearly is that of *Vampyrum*, the habits ascribed to it are those of the Desmodidae. The difficulty to actually observe the Desmodidae in action, combined with the size of *Vampyrum*, which makes it a fierce looking animal, evidently are the causes that the blood-sucking habit has been ascribed to the wrong species, which thereby became an almost legendary animal.

The first account of *Vampyrum* in Suriname known to me is that by Warren (1667, pp. 21-22; 1669, p. 17). Warren begins to state that the bats

in Suriname are harmful because they suck blood of man and beasts, and after dealing with this habit continues "Some seem as big as *Pigeons* in their flight". In the Dutch translation the word "some" is left out: "Zy gelijcken in de vlucht soo groot te sijn als Duyven" and the impression is given that the big bat is the only species present. The Dutch translation of Warren's account was practically literally copied by Van Berkel (1695, p. 129), Herlein (1718, p. 178), and Pistorius (1763, p. 73); all of these authors mention the large size of the species and that it sucks blood.

Original information on the animal was given by Fermin (1765, p. 8), who described the species as follows: "Chauve-souris (Grande) à Tête de Chien, en Latin *Vespertilio Cynocephalus, Maximus, Auritus, facie Canina,* en Hollandois *Vleder-Muys,* en Négre Anglois *Fleder-Muysi.* Lorsque les aîles de cet Animal sont étenduës, elles ont chacune dix huit à vingt pouces de longueur, ses dents sont des plus considérables; tout son corps est couvert d'un très-long poil roussâtre, ses aîles sont marbrées avec des petites taches blanches; ses oreilles sont extrêmement grandes & comme doubles. Son nez est aussi double, avec une double crête au dessus. Cette espèce de chauve-souris est fort rare, à cause de sa grandeur extraordinaire; elles font leur séjour dans les bois les plus éloignés: elles sont très-dangereuse par le dégât qu'elles peuvent faire; elles succent sans beaucoup de peine, le sang des Chevaux & d'autres Animaux; & même celui des hommes, quand ils ne se mettent pas à l'abri de leur attaque".

Fermin's description without doubt is that of *Vampyrum spectrum,* but he adds the erroneous information of the blood-sucking habit of the species. In 1769 (vol. 2, p. 139) Fermin gives a similar though slightly different account: "Les grandes *Chauve-Souris* habitent les bois. Il y en a d'une grandeur prodigieuse: celles qu'on nomme à *tête de chien,* sont de la plus grande Espece."; a Dutch translation was published one year later (Fermin, 1770, pp. 120-121).

Bancroft (1769, pp. 146-147) also mentions the present species: "The bats of *Guiana* are the same with those near the river of the *Amazone,* being twice as large as those in *England,* and having no tail. The head and body are covered with a soft fine downy hair, of a brown colour", and like the previous authors states that "They are very expert at bleeding". Hartsinck's remark (1770, vol. 1, p. 98) is largely based on that of Fermin (1765), no original observations are given. Stedman (1796, vol. 2, pp. 142-144) gave a vivid description of how he was bitten by a vampire bat in his sleep; when he awoke the bat was gone. That he did not observe the animal that attacked him is also clear from his remark that the vampire "is no other than a bat of monstrous size". He too thus confuses *Vampyrum* and the true vampire.

Stedman continued his report as follows: "As I have since had an opportunity of killing one of these bats, I cut off his head, which I here present to the reader in its natural size, and as a great curiosity, with the whole figure flying above it on a smaller scale". From the figure and the description of the coat colour given by Stedman it is most probable that the specimen belongs to *Phyllostomus hastatus*. Stedman's remark: "it is said that some are above three feet" evidently refers to the present species.

Von Sack (1810, p. 153 footnote) also reports upon a large bat: "the extent of the wings of the largest species of bat, or vampire, at Surinam, is about 16 inches; but its body from the nose to the rump is 6 inches"; this large bat was supposed to suck blood.

The story of the large blood-sucking vampire bats persists for a long time, so it was accepted by Teenstra (1835, vol. 2, p. 417), who described the present species as follows: "Men vindt hier onder de vleermuizen ook de groote boven aangehaalde *vampyrs*, welker vleugelen ieder zestien Rijnl. duimen lang zijn, terwijl het lijf van den bek tot aan het stuitbeen zes duimen lang is" (Among the bats there are also the large vampires mentioned above, whose wings each are 16 Rhineland inches [$= 16 \times 26.158 = 419$ mm] long, while the body from the muzzle to the coccyx is 6 inches long). Benoit (1839, p. 54; pl. xxxii fig. 67) gave a figure of the present species and described it as follows: "celles qu'on nomme vampires, et qui ont jusqu'à dix-huit et vingt pouces d'envergure. Leur corps, gros comme celui d'un rat, est couvert d'un poil rougeâtre ou roux foncé. Le bout de leur nez ressemble à la pointe d'une lance. Ils ont d'assez longues oreilles, et les yeux très-enfoncés dans la tête". He also assigned the blood-sucking habit to this species.

The first author in Suriname who expressed some doubt about this belief was Lammens (1844, p. 108): "Indessen weiss man nicht, ob alle Fledermäuse saugen, oder nur gewisse Gattungen. Die Schriftsteller scheinen es von denjenigen zu glauben, welche einen Kamm auf der Nase haben". Kappler (1885, p. 559) in his excellent works on Suriname goes even farther and states "Wahrscheinlich sind es mehrere Spezies und nur kleine, welche Blut saugen, da die Wunden unmöglich von einem grösseren Gebiss herrühren können", and so finally the fairy tale of the dangerous monstrous blood-sucking bat disappears. The tenacious life of this story, probably mainly due to difficulty to witness the attacks by Desmodidae and to the scarcity and awe-inspiring shape of the rather harmless *Vampyrum spectrum*, was so strong that even accounts like that by Anonymus (1768), who described the vampires as small bats, made no impression. It is not surprising therefore that also scientists were confused. Linnaeus (1758, p. 31) added to confusion

by assigning the blood-sucking habits to a fruit-eating Asiatic bat of the genus *Pteropus*, which he named *Vespertilio Vampyrus* and of which he noted: "Noctu haurit sanguinem dormientium, cristas Gallorum & lacrymas palmarum". The large South American bat was described as *Vespertilio Spectrum* by Linnaeus, who did not make any mention of the supposed blood-sucking habits. This caused some authors to believe that there were two large species of bat in South America. So De Buffon (1763, p. 60; Dutch version 1778, p. 36), basing himself on the descriptions of blood-sucking bats found in narratives dealing with South America, supposed that it might be possible that Seba's animal was not identical with the bats of these authors: "Il se pourroit donc que l'animal étrange, dont Seba nous a donné la figure, ne fût pas celui que nous indiquons ici sous le nom de *vampire*, c'est-à-dire, celui qui suce le sang." Zimmermann (1780, pp. 62-66; 419) accepted that besides *Vampyrum spectrum*, which he named on page 408: "Nr. 353. Der Blutsauger", there occurs a large bat named by him (on page 419) "Der grosse Blutsauger von Südamerika"; he supposed that this latter bat was probably identical with *Vespertilio Vampyrus* from the Old World (Africa and Asia). It is interesting that Zimmermann here referred to the German version of Bancroft's book (1769, p. 80), where in a footnote the vampire bat has been identified as probably belonging to *"Vespertilio Spectrum"*. Also Von Sack (see citation on page 14) thought that such a large bat occurred in South America, but "fortunately" not in Suriname.

Notwithstanding the fact that *Vampyrum spectrum* seems to be one of the best known species of Suriname bats, it is far from common there. It is possible that it was more numerous in old times, but Fermin (1765, p. 8) already stated: "Cette espèce de chauve-souris est fort rare, à cause de sa grandeur extraordinaire; elles font leur séjour dans les bois les plus éloignés". The small number of specimens of this species in the collections studied is also an indication that it certainly was not as common as the extensive literature on the species would lead one to believe. Also it is remarkable that these collections contain not a single specimen obtained after 1900, while most of the material is very old. While Dieperink still collected at least two specimens, Dr. D. C. Geijskes, who for the last 24 years has thoroughly explored both the coastal region and the interior of Suriname, told me that during this time he has not met with a single specimen of the species.

Biology. — Due to the scarcity of the species very little can be said about its habitats in Suriname, any additional information on this point would be most valuable. In the countries near Suriname *Vampyrum spectrum* was observed to live in hollow trees and abandoned houses. Though it has been known for quite a long time that the belief of the old authors that this bat is

blood-sucking is erroneous, there is still some diversity of opinion on what actually is the main food of the big false vampire. Ditmars (1935), who based his observations on *Vampyrum* from Trinidad, W.I., has shown that it does eat birds and rats; according to Goodwin & Greenhall (1961, p. 243) the species is "largely, if not entirely, carnivorous". Waterton (1825, p. 175), though being convinced of the blood-sucking habits of *Vampyrum* (of course he never saw them in action), made the following interesting observations in British Guiana: "He does not always live on blood. When the moon shone bright, and the fruit of the Banana-tree was ripe, I could see him approach and eat it. He would also bring into the loft, from the forest, a green round fruit, something like the wild Guava, and about the size of a nutmeg. There was something also, in the blossom of the Sawarri nut-tree, which was grateful to him; for on coming up Waratilla creek, in a moonlight night, I saw several Vampires fluttering round the top of the Sawarri tree, and every now and then the blossoms, which they had broken off, fell into the water. They certainly did not drop off naturally, for on examining several of them, they appeared quite fresh and blooming. So I concluded the Vampires pulled them from the tree, either to get at the incipient fruit, or to catch the insects which often take up their abode in flowers". Also Quelch (1892, p. 99), who gave a vivid description of his efforts to catch *Vampyrum* in British Guiana, stated: "Though these bats are to a great extent insectivorous, yet from their size they must devour a large quantity of the mangoes, star-apples, sapodillas and other soft fruits where they occur, since their stomachs, when full, contain a considerable amount of pulpy matter. And indeed their great canine teeth, as in our bats generally, seem especially adapted for piercing and tearing open the skin, rind and fleshly parts of fruits, the power for the tear being derived from the force of their flight after they have seized the fruit with their teeth".

Subfamily GLOSSOPHAGINAE

The most striking characters of the Suriname Glossophaginae are: (1) the elongated muzzle, (2) the long and highly extensile tongue, and (3) the narrow premolars and molars, the latter without a W-shaped pattern (see pls. XII-XIV). The nose leaf is small but distinct. At present six species are known from Suriname, but it is almost certain that also *Lionycteris spurrelli,* described by Thomas (1913b, pp. 270-271) from Condoto, Choco, Colombia, occurs there since Sanborn (1941, p. 376) reported the species from Itabu Creek Head, Corantijn River, British Guiana, close to the Suriname border. This species is therefore included in the following key.

If in the following text the zygomata are stated to be absent or incomplete,

this means that the zygomatic arch is cartilaginous or imperfectly ossified and therefore lost during cleaning of the skull.

KEY TO THE SURINAME FORMS OF THE GLOSSOPHAGINAE

1. Interfemoral membrane very narrow, extending to about the knee; inner upper incisors smaller than the outer (fig. 19c). Dental formula: $\frac{2.1.3.3}{0.1.3.3}$ 2
— Interfemoral membrane larger, extending to about the ankles 3
2. Length of forearm varying from 40.5 to 44 mm; calcar rudimentary; interfemoral membrane densely haired . . . . . *Anoura geoffroyi geoffroyi*, p. 139
— Length of forearm varying from 34 to 36.5 mm; calcar small but distinct; interfemoral membrane thinly pubescent . . . *Lonchoglossa caudifer caudifer*, p. 136
3. Lower incisors, at least in adults, absent 4
— Lower incisors present. Dental formula: $\frac{2.1.2.3}{2.1.3.3}$ 5
4. Upper incisors evenly and widely spaced between the canines (fig. 19d); wing membrane from the base of the outer toe. Dental formula: $\frac{2.1.2.2}{0.1.3.2}$ . . . . . *Lichonycteris obscura*, p. 135
— Upper incisors in pairs, separated by a distinct space from each other as well as from the canines; wing membrane from the foot above the base of the outer toe. Dental formula: $\frac{2.1.2.3}{0.1.3.3}$ . . . . . *Choeroniscus minor*, p. 133
5. Upper incisors of about equal size, forming a continuous row almost from canine to canine (fig. 19a); zygomatic arch complete . *Glossophaga soricina soricina*, p. 127
— Upper outer incisors conspicuously smaller than the inner, separated by spaces both from these and from the canines (fig. 19b); zygomatic arch incomplete . . . 6
6. Bases of the hairs darker than the tips . . . . . *Lionycteris spurrelli* Thomas
— Two-thirds of the basal parts of the hairs light buffy whitish, distinctly lighter than the brown tips . . . . . *Lonchophylla thomasi*, p. 141

Glossophaga soricina soricina (Pallas)

(figs. 19a, 21a, 24b; pl. XII)

Vespertilio soricinus Pallas, 1766, Miscellanea Zoologica, pp. 48-53, pl. iv figs. 16-18, and pl. v.
Glossophaga soricina, Lammens, 1844, Isis 1844, p. 108.
Glossophaga amplexicaudata, and *G. soricina*, Kappler, 1881, Holländisch-Guiana, p. 164.
Glossophaga soricina (p.p.), Jentink, 1887, Mus. Hist. Nat. Pays-Bas, vol. 9, p. 292.
Glossophaga soricina, Jentink, 1888, Mus. Hist. Nat. Pays-Bas, vol. 12, p. 207.

Type locality. — In the original description, Pallas (1766) did not note the region from which his new species originated, but in his "Spicilegia Zoologica" (1767, vol. 1, fasc. 3, p. 24) he noted that "haec species in calidioribus Americae tractibus non infrequens esse videtur, quippe quam Surinamo & e Caribaeis insulis saepiuscula adlatam vidi". Rehn (1902, p. 37 footnote 1) when describing *Glossophaga soricina antillularum* from Jamaica virtually restricted the locality of the typical form to northern South America;

Miller (1912b, p. 39; see also Miller, 1913b, p. 418) actually restricted the type locality of Pallas's species to "Surinam", the first locality mentioned by Pallas himself.

Distribution. — The present species has a wide range of distribution from Paraguay and southern Brazil northward through Central America to central Mexico; it occurs on the West Indian islands of Trinidad and Jamaica, and on the Bahamas. The typical form has been reported from northern Colombia, Venezuela, Trinidad, and the Guianas, southward to eastern Peru, Paraguay, and northern Argentina (as far south as the Rio de la Plata). The other subspecies and their distribution are dealt with by Miller (1913b, pp. 419-421), Cabrera (1958, p. 72), and Hall & Kelson (1959, pp. 114-115; map 77).

Specimens examined.

Suriname; between 1844 and 1870; A. Kappler; SMN, Nr. 264-1410, a-e: two males and three females, respectively, preserved in alcohol, skulls extracted.

Suriname; 1886, H. ten Kate; RMNH, reg. nos. 13516-13517: one female and one male, respectively, preserved in alcohol, skulls extracted (= Jentink's 1888 *G. soricina,* nos. c and d).

Suriname; date and collector unknown; RMNH, reg. no. 13513: one female, dried skin, skull inside (= Jentink's 1888 *G. soricina,* no. b).

Paramaribo; 1900, H. van Cappelle; RMNH, reg. no. 13515, a-d: four females, preserved in alcohol, skulls extracted.

Suriname; October 10, 1908, C. Heller; ZMH, Nr. 38984b: male, preserved in alcohol, damaged skull extracted.

Paramaribo; date and collector unknown; ZMH, Nr. 1860b: female, preserved in alcohol, strongly damaged skull extracted.

Paramaribo; May 6, and July 1, 1908, C. Heller; ZMH, Nr. 33804a and 33863: male and female, respectively, preserved in alcohol, damaged skulls extracted.

Suriname; August, 1911, W. C. van Heurn; RMNH, reg. no. 13504a-k: eleven females; reg. no. 13505a-e: five females; reg. no. 13506: three males. All specimens preserved in alcohol, skulls extracted.

Tijgerkreek, Saramacca River, Suriname; March 12, 1941, D. C. Geijskes; RMNH, reg. nos. 7487-7489: three females, preserved in alcohol, skulls extracted.

Djaikreek, northeastern Suriname; October 7, 1948, Suriname Expedition 1948/1949; RMNH, reg. no. 13519: male, dried skin and skull.

Galibi, mouth of the Marowijne River, Suriname; November 4, 1948, Suriname Expedition 1948/1949; RMNH, reg. nos. 16040-16041, 16043-16046: six females; reg. no. 16042: one male; reg. nos. 17594-17602: nine females. All specimens preserved in alcohol, skulls extracted.

Coastal region between Moengotapoe and Wiawia Bank, northeastern Suriname; November 20, 1948, Suriname Expedition 1948/1949; RMNH, reg. no. 13520: one female, dried skin and damaged skull.

Republiek, south of Paramaribo; June 3, 1951, D. C. Geijskes; RMNH, reg. no. 13514: one female, dried skin and skull.

Neighbourhood of Paramaribo; May 2-June 7, 1958, C. F. A. Bruijning; RMNH, reg. nos. 13512, 13518, and 17620: three males; reg. no. 17619: one female. All specimens preserved in alcohol, skulls extracted.

Neighbourhood of Paramaribo; July 25-August 11, 1958, D. C. Geijskes; RMNH, reg.

no. 13511: one female; reg. nos. 16548-16551: one male and three females, respectively. All specimens preserved as dried skins and skulls.

Frederik Willem IV Falls, Corantijn River; August 7, 1959, D. C. Geijskes; RMNH, reg. nos. 17609-17617: three males and six females, respectively, preserved in alcohol, skulls inside.

Description. — Pallas (1766, pp. 48-53; pl. iv figs. 16-18: nose, tongue and teeth; pl. v: animal, right side view); Pallas (1767, pp. 24-35; pl. iii: animal, in flight, ventral view; animal with folded wings, left side view; pl. iv fig. 1: skeleton, ventral view; figs. 2 and 11: skull; figs. 4-10: some anatomical parts); Boddaert (1768, pp. 28-38: Vliegende Spitsmuis; pls. iii-iv: same figures as given by Pallas, 1767); Wied (1826, vol. 2, pp. 179-188); Peters (1865a, pp. 352-354; 1868, p. 362: list of synonyms); Dobson (1878, pp. 499-501; pl. xxvii fig. 2: canines and incisors, front view); H. Allen (1898, pp. 242-244; pl. vi fig. 1: head, front view; figs. 2-6: skull and teeth); Miller (1907a, pp. 137-138; pls. iii fig. 2, iv fig. 2: maxillary and mandibular teeth, occlusal view); Miller (1913b, pp. 415-419; table on pp. 425-426; fig. 1a: skull, dorsal view and right side view); Vieira (1942, pp. 316-319; fig. 19: animal, ventral view); Goodwin & Greenhall (1961, pp. 244-245; pl. 20 figs. 1-3: skull).

In 46 specimens from Suriname the length of the forearm varies from 33.0 to 36.4 mm; nose leaf small but distinct, lancet about 4 mm long and 3.8 mm broad; ears short and broad, broadly rounded, about 14 mm long and 10 mm broad; tragus acutely pointed, about 4.5 mm long; tongue very long and extensile; lower lip with a deep groove in the centre, the groove bordered by small warts; interfemoral membrane well developed, when stretched extending to the level of the distal third of the tibia; tail short, about one-third the width of the interfemoral membrane, the extreme tip appearing on the dorsal surface of the membrane; calcar short but distinct, varying from 4 to 5 mm, about half as long as the hind foot; hind foot more than half as long as the tibia; wing membranes from the ankles. Fur soft and dense, extending on the wing membrane to about the distal third of the upper arm and to the basal third of the thigh. Two colour phases occur, the one more dark brown and the other more reddish brown. In both phases the hairs of the dorsal surface are bicoloured, the basal two-thirds are whitish or light buffy, the distal third is dark brown or reddish brown; the extreme tips are somewhat lighter. Ventrally the basal two-thirds of the hairs are whitish, while the distal third is light greyish brown with a still lighter tip. The colour of the wings is dark to blackish brown.

Dental formula: $\frac{2.1.2.3}{2.1.3.3}$. Upper incisors forming an almost continuous row between the canines, the cutting edges of the inner are slightly longer than

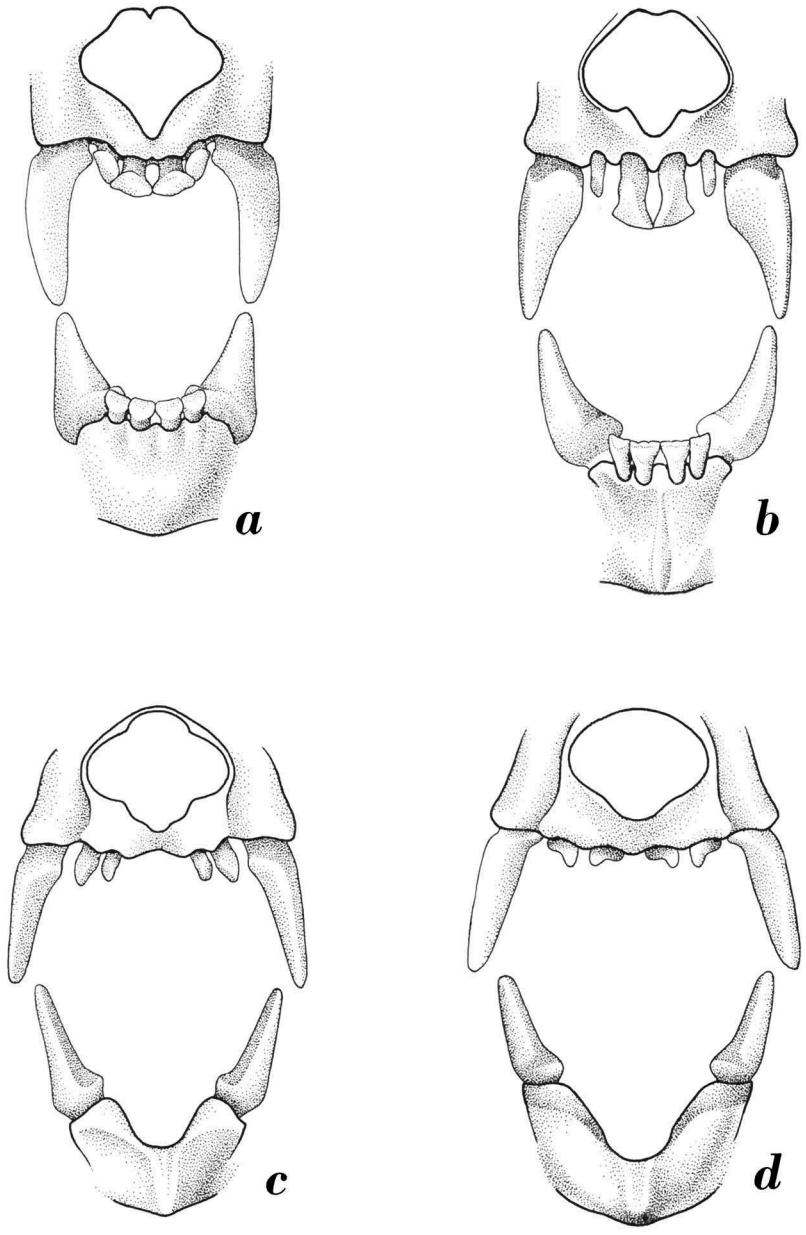

Fig. 19. Canines and incisors in front view. a, *Glossophaga soricina soricina* (Pallas), RMNH, reg. no. 13514; b, *Lonchophylla thomasi* J. A. Allen, SMN, Nr. 264, 1410,6; c, *Lonchoglossa caudifer caudifer* (E. Geoffroy), RMNH, reg. no. 13487; d, *Lichonycteris obscura* Thomas, BMNH, no. 96.10.1.20. Width across cingula canines in mm: a, 3.4; b, 3.7; c, 4.0; d, 3.3.

those of the outer; the incisors are wider than high; the upper premolars wider than high, triangular in outline when viewed from the side, the first slightly smaller than the second; the first premolar is separated by a small but distinct space from the canine, nearly or actually touching the second premolar; the second premolar is placed close to the first molar or even touches it, its shaft is somewhat higher than the crown of the molars. Lower incisors completely filling the space between the canines, about equal in size, their cutting edges scarcely rising to the level of the indistinct cingulum of the canines; canines, premolars, and molars forming a continuous row in which the teeth are in contact with each other; first lower premolar slightly wider and higher than the second; the second and third premolars are of equal size and height, they are almost or fully as high as the molars. The zygomatic arches are terete, though completely ossified; the molars are narrow, longer than broad.

The external and skull measurements of ten specimens from Suriname are given in Table XII.

Remarks. — *Glossophaga soricina* is one of the most common species of bat of Suriname. According to the collector's notes on the labels of my material the bats are found under bridges, in culverts as well as inside houses and sheds; usually they occur in colonies. Lammens (1844, p. 108) listed the species under the following words: "Nr. 358. Die Sperrnase, Zimmermann p. 491.; *Vespertilio soricinus* Erxl. — Musaraigne Buffon XIX. p. 118. t. 40. Die Länge ist 2", die Flugweite 9 bis 10, Schwanz sehr klein. Die Schnauze ist dünner, als bey den vorigen [*Phyllostomus hastatus*]; Färbung gleichförmig mausgrau; die Zunge sehr lang; hat, wie die vorige, einen Kamm auf der Nase".

Examination of the specimens reported upon by Jentink (1887, p. 292) as *Glossophaga soricina* showed that his nos. a and b actually belong to *Carollia perspicillata perspicillata* (L.), which is also one of the common Suriname bats. Jentink's misidentification is not surprising, the species can be easily confused as several authors, e.g., Dobson (1878, p. 497) and Quelch (1892, p. 100) have pointed out already. In all its dimensions *Glossophaga soricina* is smaller than *Carollia perspicillata*; in the latter species the length of the forearm is usually more than 37 mm, while in the former the forearm only rarely attains this length. In *G. soricina* the lower lip is deeply grooved over its full length above and in front, this groove being margined by small warts; in *Carollia* the lower lip shows a central large wart bordered by a row of small warts, while the tongue in that species is of normal size instead of being remarkably long and extensile as in *Glossophaga*.

Externally *Glossophaga* also closely resembles *Rhinophylla pumilio*, of

TABLE XII

External and skull measurements of ten specimens of *Glossophaga soricina soricina* (Pallas) from Suriname.

Museum		RMNH	RMNH	RMNH	RMNH	SMN	RMNH	RMNH	RMNH	RMNH	RMNH
Reg. number		13506b	13506a	13517	13506c	264-1410a	13504f	13505b	13505e	13504e	13504g
Sex		♂	♂	♂	♂	♂	♀	♀	♀	♀	♀
Forearm		34.7	34.1	34.0	35.2	33.5	34.2	35.4	35.4	33.5	36.0
Third digit,	metacarpal	33	34	33	33	34	32.5	35	34.5	33	34.5
	1st phalanx	12.5	12	12	13.5	13	12.5	13	13	12.5	13
	2nd phalanx	15	15	15	15.5	16	15.5	15.5	16	15	16
	3rd phalanx	11	10	9	10	9	10	10	10	10	10
Fourth digit,	metacarpal	31.5	31	28.5	30.5	30.5	31	32	32	31	31.5
	1st phalanx	10	9.5	9.5	10	10	9.5	9.5	9.5	9	10
	2nd phalanx	11	10	10	10.5	11.5	10.5	11	10.5	10	10.5
Fifth digit,	metacarpal	29.5	29.5	28	30	30	30.5	31.5	31.5	30.5	30.5
	1st phalanx	8.5	8.5	8.5	9	9	8	8.5	9	8	8.5
	2nd phalanx	10	10	10	10	9.5	9	10	9.5	10	10
Tibia		13	13	13.5	13.5	13	13	13.5	13.5	13	13
Hind foot		10	8.5	8.5	9.5	9	9.5	10	9	10	9
Calcar		4.5	4	4.5	4	4.5	5	5	4.5	4	4.5
Skull:											
greatest length		18.8	19.3	19.8	20.0	20.1	19.6	19.8	20.1	20.3	20.3
condylobasal length		17.7	18.0	18.5	18.4	19.4	18.4	18.6	18.9	18.6	19.1
condyle to front of canine		17.2	17.4	17.7	17.5	18.3	17.7	17.7	18.2	17.7	18.2
basal length		15.5	15.8	16.2	16.4	16.8	15.5	16.2	16.8	16.2	16.8
palatal length		10.0	10.3	9.9	10.5	10.7	10.0	10.5	10.6	10.4	10.6
zygomatic breadth		8.7	9.0	8.9	8.7	8.9	—	9.0	8.8	—	8.9
breadth of braincase		8.4	8.4	8.4	8.3	8.4	8.3	8.5	8.2	8.7	8.6
height of braincase		7.1	7.3	7.3	7.3	7.3	6.8	7.2	7.1	7.4	7.3
mastoid breadth		8.5	8.5	8.7	8.7	8.6	8.6	8.7	8.5	8.8	8.9
interorbital constriction		3.7	3.8	3.9	3.7	3.8	3.6	3.9	4.0	4.0	4.0
postorbital constriction		4.4	4.5	4.7	4.6	4.4	4.5	4.6	4.5	4.6	4.6
width across molars		5.0	5.0	5.2	5.0	5.1	4.9	5.1	5.0	5.1	5.2
width across canines		3.3	3.5	3.5	—	3.5	3.4	3.7	3.5	3.6	3.6
upper tooth-row, c - m^3		6.4	6.4	6.7	6.5	6.8	6.6	6.5	6.6	6.5	.6.8
lower tooth-row, c - m_3		6.9	6.8	7.1	6.9	7.2	7.0	6.9	7.2	6.9	7.2
length of mandible		12.4	12.6	12.8	13.1	13.2	13.1	12.4	13.3	13.1	13.2

which the maximum length of the forearm is about 35 mm. In *Rhinophylla,* however, the external tail is absent, the tongue is of normal size, and the lower lip shows a central wart with a larger longitudinal wart on either side (fig. 23b).

Formerly *Glossophaga soricina* was considered a blood-sucking bat, possibly because of the remarkable length of its tongue. Later on it was thought to be an insect-eating bat. According to Goodwin & Greenhall (1961, p. 245), however, the species in reality feeds on nectar and soft pulpy fruits, and perhaps seeds; according to those authors the insects in the stomachs of the animals probably had been trapped in nectar.

Choeroniscus minor (Peters)

(fig. 21b; pl. XII)

Choeronycteris minor Peters, 1868, Monatsber. Akad. Wiss. Berlin 1868, pp. 366-367.
Choeronycteris minor, Kappler, 1881, Holländisch-Guiana, p. 164.

Type locality. — "Surinam".

Distribution. — Since the systematic position of the described South American forms of *Choeroniscus* is uncertain, I give here the range of distribution of each form as found in the literature. *Ch. minor* has been recorded from Suriname, Brazil, and Ecuador; *Ch. intermedia* (J. A. Allen & Chapman) from Trinidad, W.I.; *Ch. inca* (Thomas) from Peru, while Sanborn (1954, pp. 290-291) mentioned specimens from Venezuela and British Guiana, which in his opinion agree best with the Peruvian form.

Specimen examined.

Suriname; 1851, A. Kappler; SMN, Nr. 441: adult holotype male, preserved in alcohol, skull extracted.

Description. — The original description of the type specimen by Peters is rather short, and incomplete; some of the external measurements given by him are incorrect, while he did not provide any skull measurements. The following description is based on the type specimen.

Length of forearm 34.8 mm; nose leaf well developed, lancet about 4 mm high and 3.4 mm broad; ears rounded above, the outer margin of the ear conch slightly concave in its upper half, about 10.5 mm long and 7 mm broad; tragus small, pointed, notched at the apex; interfemoral membrane well developed, extending in the middle to about the level of the ankles, about 15 mm wide, the posterior margin somewhat concave; calcar distinct, nearly 6 mm, much shorter than the foot, which is about 7.5 mm; tail about one-third the width of the interfemoral membrane, the extreme tip appearing on the dorsal surface of the membrane; wing membrane from the foot above

the base of the outer toe; the fur extends on both surfaces of the elbows and more sparsely on both surfaces of the basal third of the forearm; the type is too bleached to show anything of the colour of the fur. Some additional external measurements are (in mm): length of third metacarpal, 35.3; first phalanx, 12; second phalanx, 17.5; third phalanx, tip included, 9.5; length of fourth metacarpal, 32.6; first phalanx, 8.5; second phalanx, 11; length of fifth metacarpal, 31.0; first phalanx, 7.5; second phalanx, 10: tibia, 12.2.

Dental formula: $\frac{2.1.2.3}{0.1.3.3}$. In *Choeroniscus* the upper incisors occur in pairs, the pairs separated from each other as well as from the canines, like in *Anoura* and *Lonchoglossa* (see fig. 19c); in the holotype of *Ch. minor,* however, the anterior margin of the praemaxilla is somewhat damaged, with the result that the upper incisors have fallen out, except the left outer incisor. The cheek-teeth of the upper and lower jaws are more or less distinctly spaced; there is a distinct diastema between the canines and the first upper premolars. However, between the left canine and the left first upper premolar of the holotype, a very minute tooth is present; as this supernumerary tooth is widely separated from the following premolar, it is improbable that this tooth is a persistent milk-tooth of that premolar. Some cranial measurements are as follows: greatest length, 21.9; condylobasal length, 21.6; condyle to front of canine, 21.4; basal length, 20.0; palatal length, 14.0; zygomatic breadth, 8.5; breadth of braincase, 8.8; height of braincase, 7.2; mastoid breadth, 8.6; interorbital constriction, 3.3; width across molars, 4.6; width across cingula canines, 3.4; upper tooth-row, c-m^3, 7.7; lower tooth-row, c-m_3, 8.0; length of mandible, 16.1.

Remarks. — Goodwin & Greenhall (1961, p. 249) remark that the type of *Choeronycteris minor* was destroyed during the second World War. It is without doubt that the specimen of *Ch. minor* that I received on loan from the Stuttgart Museum is the type of that species. On the label is not only indicated "Original-Exemplar", but Peters noted in his description that he examined one adult male: "Das einzige mir bekannte Exemplar, nach der Entwickelung der Geschlechtsorgane und der Beschaffenheit der Gelenke ein reifes Männchen, stammt aus Surinam und befindet sich in dem Cabinet zu Stuttgart". Peters made evidently a mistake when he gave the length of the calcar as 11 mm and that of the tibia as 11.5 mm, these lengths being in fact nearly 6 and 12.2 mm, respectively. For this reason it is understandable that Allen & Chapman (1893, pp. 207-208) considered the specimens of *Choeronycteris* from Trinidad, W.I., specifically different from *Ch. minor.* In this respect it is worth while to note the opinion of Thomas (1912a, p. 404): "The Trinidad bat described by Allen and Chapman as *Ch. intermedia* is very

probably the same as *Ch. minor,* as those authors were deceived by Peters's impossible measurement of 11 mm. for the calcar, an organ drawn as about 5 mm. long in the more recently published plate of the latter species (Chiropt. Mus. Berol. pl. viii, *a*)".

However, in my opinion far more material of *Ch. minor, Ch. intermedia,* and *Ch. inca* is needed to clear up the relation between these forms; see also Sanborn (1954, pp. 290-293) on this interesting problem. All authors agree that the Central American form, *Ch. godmani,* described by Thomas (1903a, pp. 288-289) from Guatemala, is certainly different from the South American forms.

Thomas (1928a, p. 122) subdivided the genus *Choeronycteris* and made *Ch. minor* the type of his new genus *Choeroniscus.*

Lichonycteris obscura Thomas

(figs. 19d, 21c; pl. XIII)

Lichonycteris obscura Thomas, 1895, Ann. Mag. Nat. Hist., ser. 6, vol. 16, pp. 56-57. (Erroneously written as *L. obscurus* on p. 55 since the gender of *Lichonycteris* is feminine).

Lichonycteris obscurus, Miller, 1900, Proc. Biol. Soc. Washington, vol. 13, p. 156.

Lichonycteris obscura, Miller, 1907, Families and genera of bats, p. 143; Journ. Mammalogy, 1931, vol. 12, p. 411.

Type locality. — "Managua, Nicaragua".

Distribution. — The species has been reported from Nicaragua, Costa Rica, and Suriname.

Specimen examined.

From Costa Rica: San José; date unknown, C. F. Underwood; BMNH, no. 96.10.1.20: adult male, preserved in alcohol, skull extracted.

Description. — Thomas (1895, pp. 55-57); Miller (1907a, pp. 143-144); Sanborn (1943, pp. 272 and 274); Goodwin (1946, pp. 314-315; fig. 29: head, front view). Some characters not given in Thomas's description of the species are to be found in that of the genus (1895, pp. 55-56).

Length of forearm varying from 31.5 to 33.5 mm; nose leaf small but distinct, about as broad as high; ears short, evenly rounded off above, about 9.5 mm in length; tragus about one-third the length of the ear; interfemoral membrane well developed, extending to the level of the ankles; wing attached at the base of the outer toe; calcar, about 7 mm, shorter than the foot; tail reaching to about the middle of the interfemoral membrane, its tip appearing on the dorsal surface of the membrane. Basal third of forearm hairy; colour of the dorsal surface as well as that of the ventral surface dark brown.

Dental formula: $\frac{2.1.2.2}{0.1.3.2}$. Upper incisors evenly and widely spaced between canines (see fig. 19d); zygomatic arch incomplete; lower incisors, at least in adult specimens, absent.

The following external and skull measurements were taken from the examined Costa Rica specimen. Forearm, 31.5; length of third metacarpal, 33.2; first phalanx, 13; second phalanx, 17; third phalanx, 11.5; length of fourth metacarpal, 30; first phalanx, 8.5; second phalanx, 11; length of fifth metacarpal, 27.5; first phalanx, 7.5; second phalanx, 10; length of ear, 9.5; tragus, about 3; tibia, 12; hind foot, 8.5; calcar, 7. — Skull: greatest length, 18.2; condylobasal length, 17.2; condyle to front of canine, 16.7; basal length, 15.1; breadth of braincase, 7.7; height of braincase, 6.6; interorbital constriction, 3.8; width across molars, 4.2; width across cingula canines, 3.3; upper tooth-row, c-m^2, 5.3; lower tooth-row, c-m_2, 5.8; length of mandible, 12.0.

Remarks. — *Lichonycteris obscura* has only once been reported from Suriname, namely by Miller (1900), who noted: "While identifying some old skins in the United States National Museum I recently found a specimen labeled "Surinam, Edw. Koebel". It is without further history except that it was entered in the Museum register, as No. 14815 on March 6, 1885. The known range of the genus is thus greatly extended. In all respects the Surinam specimen exactly agrees with the character given in the original description".

The Costa Rica male described here is smaller in all its dimensions than the female specimen mentioned by Sanborn (1936, p. 99).

A second species of the present genus has been described by Miller (1931, p. 411), namely *Lichonycteris degener* from Pará, Estado de Pará, Brazil. Vieira (1942; 1955) in his two important books on Brazilian mammals, however, omits the present genus entirely.

Lonchoglossa caudifer caudifer (E. Geoffroy)

(figs. 12f, 19c, 20; pl. XIV)

Glossophaga caudifer E. Geoffroy, 1818, Mém. Mus. Hist. Nat. Paris, vol. 4, p. 418; pl. 17 (A: animal, ventral view; B: head, front view).
Lonchoglossa caudifera, Peters, 1868, Monatsber. Akad. Wiss. Berlin 1868, p. 364.
Lonchoglossa caudifera, Jentink, 1888, Mus. Hist. Nat. Pays-Bas, vol. 12, p. 207.

Type locality. — "Le Brésil, aux environs de Rio-Janeiro".

Distribution. — The species occurs from eastern and central Brazil through the Guianas to Venezuela, Colombia, Ecuador, and Peru. The typical form was reported from Brazil, the Guianas, Venezuela, and Colombia, while *L.*

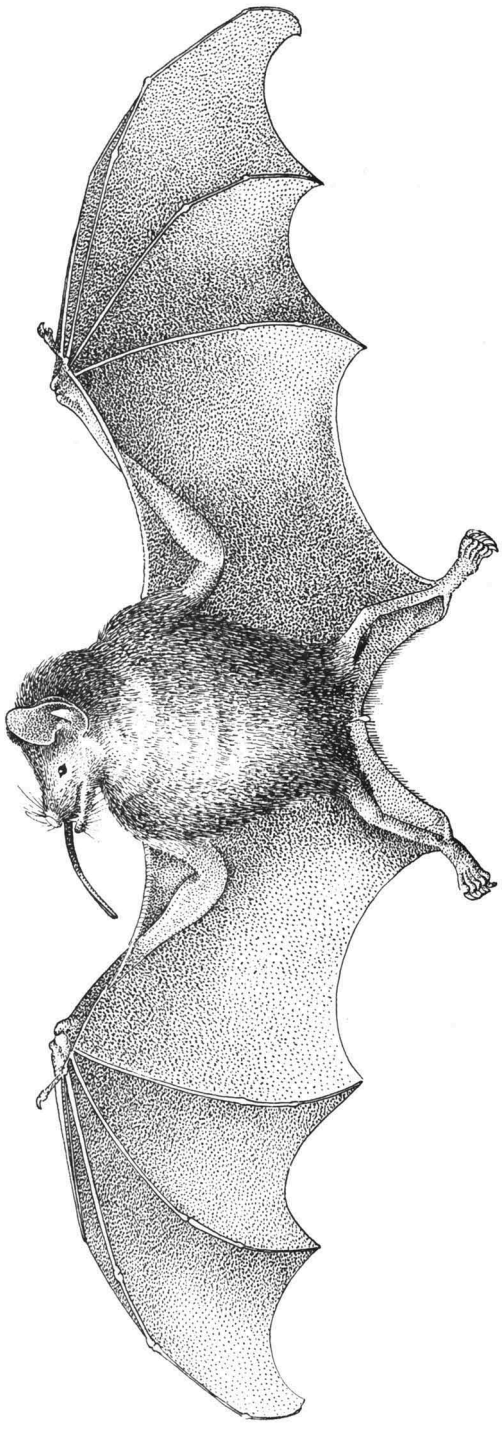

Fig. 20. *Glossophaga caudifer* [= *Lonchoglossa caudifer caudifer* (E. Geoffroy)]. After E. Geoffroy, 1818, pl. 17 fig. A. 6/7 × original size.

caudifer aequatoris Lönnberg, originally described from Illambo, Gualea, Ecuador, was also reported from western Peru (see Sanborn, 1943, p. 276).

Specimens examined.

Jodensavanne, Suriname River; May, 1954, J. Lindeman; RMNH, reg. no. 13487: adult female, dried skin and skull.

Suriname; between 1824 and 1836, H. H. Dieperink; RMNH, reg. no. 17348: dried skin in poor condition, damaged skull extracted (= Jentink's 1888 *L. caudifera,* no. a).

Description. — E. Geoffroy (1818, p. 418); Dobson (1878, pp. 506-507; pl. xxvii figs. 4-4b: tooth-row of left upper and lower jaws); Miller (1907a, pp. 140-141); G. M. Allen (1908, pp. 37-38); Sanborn (1933). The original description by E. Geoffroy is extremely short: "Membrane interfémorale très-courte. Un queue qui la déborde". An excellent figure of the animal was given by Geoffroy (1818) on his pl. 17 (see fig. 20 of the present paper).

Length of forearm varying from 34 to 38.1 mm; nose leaf small but distinct; ears rather small, rounded above; tragus small, less than one-third the ear length; interfemoral membrane narrow, having a few fine hairs which form a thin fringe along its free margin; calcar short but distinct, about 4.5 mm, nearly half the length of the hind foot; tail very short, sometimes imperfectly ossified and often hidden in the base of the membrane; wing membrane attached at the basal part of the ankles. Fur of the dorsal surface dark brown, the tips of the hairs are more yellowish brown; the fur of the shoulder region is more light yellowish brown; ventral surface somewhat darker, more greyish brown than the posterior part of the dorsal surface.

Dental formula: $\frac{2.1.3.3}{0.1.3.3}$. Upper incisors in pairs (see fig. 19c), the inner widely separated from each other, smaller than the outer; the outer incisors are separated from the canines by a wide space; lower incisors, at least in adults, absent; zygomatic arch slender, but definitely ossified.

External measurements (taken from the animal before skinning) and skull measurements of the examined Jodensavanne specimen. Forearm, 36.2; length of third metacarpal, 36.6; first phalanx, 12; second phalanx, 18; third phalanx, 10.5; length of fourth metacarpal, 34.5; first phalanx, 9; second phalanx, 12.5; length of fifth metacarpal, 30; first phalanx, 7.5; second phalanx, 11.5; ear, length, 10; ear, breadth, 7; tragus, about 3; tibia, 12.5; hind foot, 11; calcar, 4.5; depth of interfemoral membrane from middle of rump, 3.5. — Skull: greatest length, 23.2; condylobasal length, 22.3; condyle to front of canine, 21.4; basal length, 20.2; palatal length, 12.0; zygomatic breadth, 9.6; breadth of braincase, 8.7; height of braincase, 7.1; mastoid breadth, 9.2; postorbital constriction, 4.5; width across molars, 5.4; width across cingula canines, 4.0; upper tooth-row, c-m^3, 8.5; lower tooth-row, c-m_3, 8.9; length of mandible, 16.3.

Remarks. — With some reserve I consider the second Suriname specimen (RMNH, reg. no. 17348) to belong to the present species. In this specimen the length of the upper tooth-row is 7.5 mm, and that of the lower tooth-row, 8.2 mm; these values are much smaller than those mentioned in the literature (see Hershkovitz, 1949, p. 439). This is the more striking since the other measurements taken from the damaged skull agree rather well with those of the Jodensavanne specimen: postorbital breadth, 4.3; width across molars, 5.1; width across cingula canines, 3.9; length of the mandible, 15.9; the length of the forearm, taken from the dried skin, is 36 mm, while that of the third, fourth, and fifth metacarpal bones is 36, 34, and 30 mm, respectively. However, far more material is needed to arrive at definite ideas about the variability of Suriname material of *Lonchoglossa caudifer*.

Most authors emend the original specific name *caudifer* to *caudifera*. In my opinion, however, there is no reason for such an emendation and therefore I use Geoffroy's original spelling.

Anoura geoffroyi geoffroyi Gray

(fig. 28a; pl. XIV)

Anoura Geoffroyi Gray, 1838, Mag. Zool. and Bot., vol. 2, p. 490.

Type locality. — In the original description given as Brazil. Sanborn (1933, p. 26) noted that the type locality "probably" is Rio de Janeiro, but Vieira (1942, p. 324; 1955, p. 363) and Cabrera (1958, p. 75) give without comments this locality as the type locality. In this respect it is worth while to note that Peters (1869, p. 399) mentioned a specimen from Rio de Janeiro preserved in the Paris Museum, and if we accept that Wied's (1826, vol. 2, p. 217) *Glossophaga ecaudata* E. Geoffroy is identical with *Anoura geoffroyi* (see Sanborn, 1933, p. 26), then it is certain that already Wied observed the present species at Rio de Janeiro. Anyhow, through Vieira's action Rio de Janeiro, Brazil, has become the restricted type locality of the species.

Distribution. — The range of the species extends from southern Brazil through northern S. America and Central America north into Mexico. The typical form has been reported from Brazil, Bolivia, Venezuela, and Trinidad, while I examined specimens from Suriname and French Guiana. For the two other subspecies I may refer to Sanborn (1933, pp. 26-27).

Specimens examined.

Anton van Aerde Cave, Tafelberg Mt., interior of Suriname; April 2, 1958, D. C. Geijskes; RMNH, reg. nos. 16413-16417 and 16419: six adult males, skins and skulls.

Cayenne, French Guiana; date and collector unknown; RMNH, reg. no. 13486: male, skin, damaged skull extracted (= Jentink's 1888 *Lonchoglossa caudifera*, no. c).

Description. — The original description by Gray (1938) is very short; Dobson (1878, p. 507: *Lonchoglossa wiedii*; pp. 508-509: *Glossonycteris geoffroyii*); Miller (1907a, pp. 139-140); Goodwin & Greenhall (1961, pp. 246-247; fig. 45: nose leaf and tongue; fig. 47: head, left side view; fig. 48: interfemoral membrane, dorsal view; pl. 21 figs. 1-3: skull).

Forearm varying from 40 to 44.3 mm; nose leaf small but distinct; ears, about 10 mm long and 7 mm broad, rounded above; tragus small, about one-third the length of the ear; interfemoral membrane very narrow, about 2.5 to 4 mm wide, in the middle about 1 mm deep, wholly clothed with hair, which forms a fringe along the free margin of the membrane; calcar small and poorly developed, about 2.5 to 4 mm long; tail absent; wing membrane from the basal part of the ankles; hairs of the dorsal surface bicoloured, the basal half or three-fourths pale buff-brown, the tips dark brown; ventral surface more dark greyish brown, the tips being a shade lighter.

Dental formula: $\frac{2.1.3.3}{0.1.3.3}$. Upper incisors in pairs, separated by a distinct space; inner incisors smaller than the outer; outer incisors separated by distinct spaces from the canines; lower incisors absent, at least in adults; zygomatic arch incomplete or imperfectly ossified.

For the external and skull measurements see Table XIII; the former are taken from the dried skins.

Remarks. — In the six examined Suriname specimens the area between the shoulders, dorsally as well as ventrally, is somewhat lighter tinged than the rest of the body, caused by the fact that in this region the basal parts of the hairs are much lighter. This is particularly well shown in specimen no. 16413: on the neck and the shoulders the hairs are pure white, the extreme tips only being dark brown; on the throat the hairs are silvery white, their tips being greyish brown.

There are hardly any arguments to justify the separation of the two monotypical genera *Lonchoglossa* and *Anoura*. As pointed out by Sanborn (1933, p. 24; 1943) the two genera are only distinguished by the size, the development of the calcar, and the extent of the fur, while such characters usually are considered to be of specific value only. However, taking into account that the same can be said for other genera and that the present two genera for so long have been treated as distinct, I follow here Sanborn. That Simpson (1945, p. 57) treated *Anoura* as a junior synonym of *Lonchoglossa* and not the reverse is apparently a lapsus by this author, who considered the date of *Lonchoglossa* to be 1818 instead of 1868.

In the Suriname specimens of *Anoura* the ossification of the zygomatic arch is subject to variation: in three specimens the zygomata are cartilaginous,

TABLE XIII

External (dried skins) and skull measurements of six males of *Anoura geoffroyi geoffroyi* Gray from Suriname and of one male from French Guiana.

RMNH, reg. number	16413	16414	16415	16416	16417	16419	13486
Forearm	41.2	43.8	41.4	43.2	40.5	42.2	±42
Third digit, metacarpal	39	43	—	42	40	41.5	40.5
1st phalanx	12.5	14	—	13	13	12.5	12.5
2nd phalanx	21	23	—	22	22	21	21
3rd phalanx	14	15	—	14	14	15	—
Fourth digit, metacarpal	38	42	—	40	40	40	38.5
1st phalanx	9.5	10.5	—	10	10	9	10
2nd phalanx	13	15.5	—	14.5	14	13	13.5
Fifth digit, metacarpal	32.5	36	—	34.5	34.5	34.5	33.5
1st phalanx	8	8	—	8	8	8	7.5
2nd phalanx	11.5	15	—	14	12	13.5	12
Tibia	15	15	—	17	—	15	—
Hind foot	10	10.5	—	11	—	10	—
Calcar	2	3	2.5	4	2.5	4	—
Skull:							
greatest length	—	25.7	25.5	25.4	26.5	25.5	—
condylobasal length	—	24.8	24.8	24.6	25.3	25.0	—
condyle to front of canine	—	24.0	23.8	23.7	24.6	24.4	—
basal length	—	22.2	22.3	22.1	23.1	—	—
palatal length	—	14.1	13.5	14.2	14.8	—	—
zygomatic breadth	—	11.2	11.0	11.2	11.0	11.3	—
breadth of braincase	—	9.8	10.0	10.2	10.2	9.7	—
height of braincase	—	8.0	8.4	8.2	8.4	7.8	—
mastoid breadth	—	10.7	10.7	10.5	10.4	—	—
postorbital constriction	5.2	4.9	5.2	5.2	5.1	5.1	4.9
width across molars	6.4	6.4	6.5	6.4	—	6.4	6.2
width across cingula canines	—	5.2	5.2	5.1	4.8	5.1	4.5
upper tooth-row, c - m^3	9.2	9.7	9.8	9.6	—	9.9	9.4
lower tooth-row, c - m_3	9.5	10.1	10.2	9.8	10.3	10.4	9.7
length of mandible	17.6	18.5	17.6	18.2	18.9	18.7	17.4

in three others they are ossified. Also the place of the first upper premolars between the canines and second premolars varies.

According to the data found in the literature *Anoura geoffroyi* is a cave bat (Felten, 1956a, p. 198; Goodwin & Greenhall, 1961, p. 247). No detailed information is available on the Anton van Aerde Cave at Tafelberg Mt., where the present Suriname specimens have been collected.

Lonchophylla thomasi J. A. Allen

(figs. 19b, 21d; pl. XIII)

Lonchophylla thomasi J. A. Allen, 1904, Bull. Amer. Mus. Nat. Hist., vol. 20, p. 230.

Type locality. — "Ciudad Bolivar, Venezuela".

Distribution. — Venezuela; Suriname.

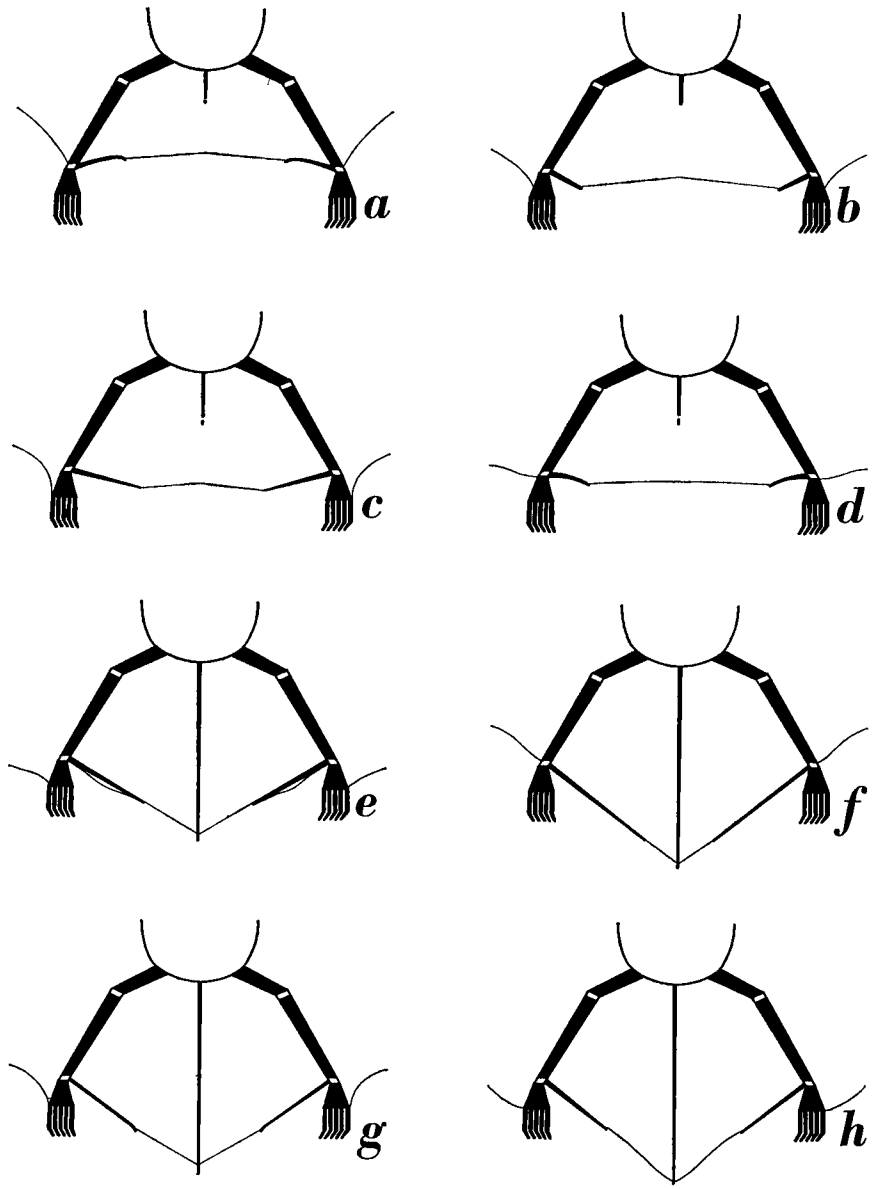

Fig. 21. Diagrams of interfemoral membranes, ventral view, showing the various forms to be observed in Suriname Glossophaginae (a-d), and Vespertilionidae (e-h). a, *Glossophaga soricina soricina* (Pallas); b, *Choeroniscus minor* (Peters); c, *Lichonycteris obscura* Thomas; d, *Lonchophylla thomasi* J. A. Allen; e, *Myotis albescens* (E. Geoffroy); f, *Myotis surinamensis* nov. nom.; g, *Eptesicus melanopterus* (Jentink); h, *Dasypterus ega ega* (Gervais).

Specimens examined.

Nassau Mts., Marowijne River; February 25, 1949, Suriname Expedition 1948/1949; RMNH, reg. no. 17346 and 17347: adult male and female, respectively, dried skins and skulls.

Suriname; between 1844 and 1870, A. Kappler; SMN, Nr. 264, 1410, 6: male, preserved in alcohol, skull extracted.

Description. — Thomas (1903 c, pp. 458-459); J. A. Allen (1904, p. 230); Miller (1907a, p. 139).

Length of forearm varying from 31 to 32.3 mm; nose leaf well developed, length × breadth, about 6.5 × 4.5 mm; ears rounded, about 9 mm in length; tragus small, about one-third the ear length; interfemoral membrane well developed, reaching to about the ankles; calcar short but distinct, about 5.5 mm; tail not reaching half-way the interfemoral membrane, the extreme tip terminating on the dorsal surface; wing membranes from the base of the ankles. Colour of the upper parts dark russet brown, the basal two-thirds of the hairs being somewhat buffy whitish; colour of the under parts about of the same tinge as the dorsal surface, the membranes and the ears are dark brown.

Dental formula: $\frac{2.1.2.3}{2.1.3.3}$. Inner upper incisors with broad cutting edges, conspicuously larger than the small conical outer incisors, which are separated by distinct spaces from the inner incisors as well as from the canines (see fig. 19b); zygomatic arch incomplete.

External and skull measurements of the three examined Suriname specimens: SMN (male), RMNH (male and female), respectively. Forearm, 31.2, 32.3, 32; length of third metacarpal, 32.8, 34, 32; first phalanx, 12.5, 14, 13; second phalanx, 15, 17, 15; third phalanx, 10, 8.5, 9; length of fourth metacarpal, 30, 30.5, 30; first phalanx, 9, 10, 9; second phalanx, 9.5, 10.5, 9.5; length of fifth metacarpal, 31, 30, 30; first phalanx, 8, 8, 8.5; second phalanx, 8.5, 8.5, 9; tibia, about 12.5; hind foot, about 8; calcar, about 5.5. — Skull: greatest length, 19.6, 20.5, 19.7; condylobasal length, 19.1, 19.6, 18.8; condyle to front of canine, 18.6, 19.1, 18.2; basal length, 17.1, 17.4, 16.7; palatal length, 10.9, 11.1, 10.5; breadth of braincase, 8.5, 8.2, 8.2; height of braincase, 6.8, 6.8, 6.8; mastoid breadth, 8.7, 8.8, 8.5; postorbital constriction, 4.1, 3.9, 4.0; width across molars, 5.0, 5.0, 4.8; width across cingula canines, 3.7, 3.7, 3.5; upper tooth-row, c-m^3, 6.4, 6.8, 6.4; lower tooth-row, c-m_3, 6.8, 7.1, 6.5; length of mandible, 13.7, 14.0, 13.2.

Remarks. — As far as known to me the present Suriname specimens are the first to be recorded since the original description of *Lonchophylla thomasi*. The present species is the smallest of the genus. It is closely related to *L. mordax*, described by Thomas (1903c, pp. 459-460) from Lamarão, N.W.

of Bahia, Brazil, alt. 300 m. In its dimensions *L. mordax* is larger than *L. thomasi*; according to Sanborn (1941, p. 375) the length of the forearm of eighteen males of *L. mordax* varies from 33.8 to 36.7 mm, while Thomas noted that in the type the length of the upper tooth-row (front of canine to back of m^3) is 8.1 mm, and that of the lower tooth-row 8.7 mm.

According to the accompanying label the two specimens of the 1948-1949 Suriname Expedition were collected "under the projecting bank of a forest-brook".

Externally, *Lonchophylla thomasi* closely resembles *Glossophaga soricina* and *Lionycteris spurrelli*; the most striking differences between these three bats are given in the key on page 127.

Subfamily CAROLLIINAE

The external characters distinguishing the Suriname Carolliinae from the other Phyllostomidae are mentioned in the key on page 73 of the present paper. Two of the most striking characters, however, by which the Carolliinae can easily be recognized, are those of the structure of the narrow upper molars which do not show the W-pattern found in most other groups, and that of the incomplete zygomata. In these characters, it is true, the Carolliinae resemble the Glossophaginae; as, however, all Suriname Glossophaginae have three lower premolars instead of two, they may be readily distinguished from the Carolliinae.

The Carolliinae are represented in Suriname by the genera *Carollia* and *Rhinophylla*. Besides the common *Carollia perspicillata perspicillata* I found among my Suriname material two specimens of which the length of the upper and lower tooth-rows is so much smaller than that of the other specimens, that I consider them, at least provisionally, to belong to *Carollia castanea castanea*.

Key to the Suriname Carolliinae

1. Length of forearm varying from about 38 to 44 mm; length of upper tooth-row, c-m^3, 7.0 mm or more . . . . . *Carollia perspicillata perspicillata*, p. 144
— Length of forearm less than 38 mm; length of upper tooth-row, c-m^3, less than 7 mm 2
2. Length of forearm varying from 30 to 35 mm; no external tail; length of upper tooth-row, c-m^3, less than 6 mm. Lower lip with a rounded central wart flanked on each side by a large elongate wart (fig. 23b) . . . . *Rhinophylla pumilio*, p. 152
— Length of forearm varying from 34 to 38 mm; external tail slender; length of upper tooth-row, c-m^3, varying from 6.1 to 6.7 mm. Lower lip with a large central rounded wart bordered by a row of small warts (like in *C. perspicillata*; see fig. 23a) . . . . . *Carollia castanea castanea*, p. 149

Carollia perspicillata perspicillata (Linnaeus)

(figs. 12g, 18c, 22, 23a; pl. XV)

Vespertilio perspicillatus Linnaeus, 1758, Systema Naturae, ed. 10, vol. 1, p. 31.
Phyllostoma brevicaudata, Kappler, 1881, Holländisch-Guiana, p. 163.

Carollia brevicaudata, Kappler, 1881, Holländisch-Guiana, p. 164.
Glossophaga soricina (p.p.), Jentink, 1887, Mus. Hist. Nat. Pays-Bas, vol. 9, p. 292.
Carollia brevicauda, Jentink, 1887, Mus. Hist. Nat. Pays-Bas, vol. 9, pp. 291-292; 1888, vol. 12, p. 296.
Hemiderma brevicauda, Sanderson, 1939, Caribbean Treasure, p. 146.

Type locality. — "America". Restricted by Thomas (1911a, p. 130) to "Surinam".

Distribution. — The species has a wide range, extending from the northern part of southern Mexico and Guatemala south and east through Central America and the larger part of South America as far south as Peru and S. Brazil (the Matto Grosso and Santa Catharina); the species has been reported also from Jamaica, Grenada, Tobago, and Trinidad (see Hall & Kelson, 1959, pp. 123-124, and map 88; Cabrera, 1958, pp. 76-77). The typical form occurs on the mainland of South America and on the above mentioned Lesser Antilles.

Specimens examined.

Suriname; between 1824 and 1836, H. H. Dieperink; RMNH, reg. nos. 17480-17485: six specimens, dried skins, skulls inside (= Jentink's 1888 *C. brevicauda,* nos. a-f).

Suriname; date unknown, A. Kappler; SMN, Nr. 289½, 2: one male, preserved in alcohol, skull extracted.

Marowijne River region; 1877, C. Schneider; RMNH, reg. no. 17477: one male, skeleton only (= Jentink's 1887 *C. brevicauda,* no. a).

Suriname; 1886, H. ten Kate; RMNH, reg. nos. 17565 and 17566: one male and one female, respectively, preserved in alcohol, skulls extracted (= Jentink's 1888 *C. brevicauda,* nos. l and m).

Suriname; date and collector unknown; RMNH, reg. nos. 17487 and 17488: sex unknown, two skeletons (= Jentink's 1887 *Glossophaga soricina,* nos. a and b).

Suriname; date and collector unknown; RMNH, reg. nos. 17478 and 17479: sex unknown, two skeletons (= Jentink's 1887 *C. brevicauda,* nos. b and c).

Suriname; date and collector unknown; RMNH, reg. no. 17486: sex unknown, dried skin, skull inside (= Jentink's 1888 *C. brevicauda,* no. g).

Suriname; date and collector unknown; RMNH, reg. nos. 17561, 17560, and 17562: one male and two females, respectively, preserved in alcohol, skulls extracted (= Jentink's 1888 *C. brevicauda,* nos. o, n, and p, respectively).

Paramaribo; September 30, 1898, I. Michaelis; ZMH, Nr. 2352a, b, and c: three males, preserved in alcohol, skulls extracted.

Paramaribo; 1903, M. Greshoff; RMNH, reg. nos. 17563 and 17564: one male and one female, respectively, preserved in alcohol, skulls extracted.

Suriname; October 10, 1909, C. Heller; ZMH, Nr. 38984a: one male, preserved in alcohol, damaged skull extracted.

Paramaribo; August, 1911, W. C. van Heurn; RMNH, reg. nos. 17590 and 17591, 17589, 17592, and 17593: two males and three females, respectively, preserved in alcohol, skulls extracted.

Suriname; 1922, Expedition to Hendrik Mt.; ZMA, no. 1524b: one female, preserved in alcohol, skull extracted.

Suriname; December, 1930, collector unknown; ZMA, no. 1620: one female, preserved in alcohol, skull extracted.

Peperpot, Paramaribo; September 14, 1948, Suriname Expedition 1948/1949; RMNH,

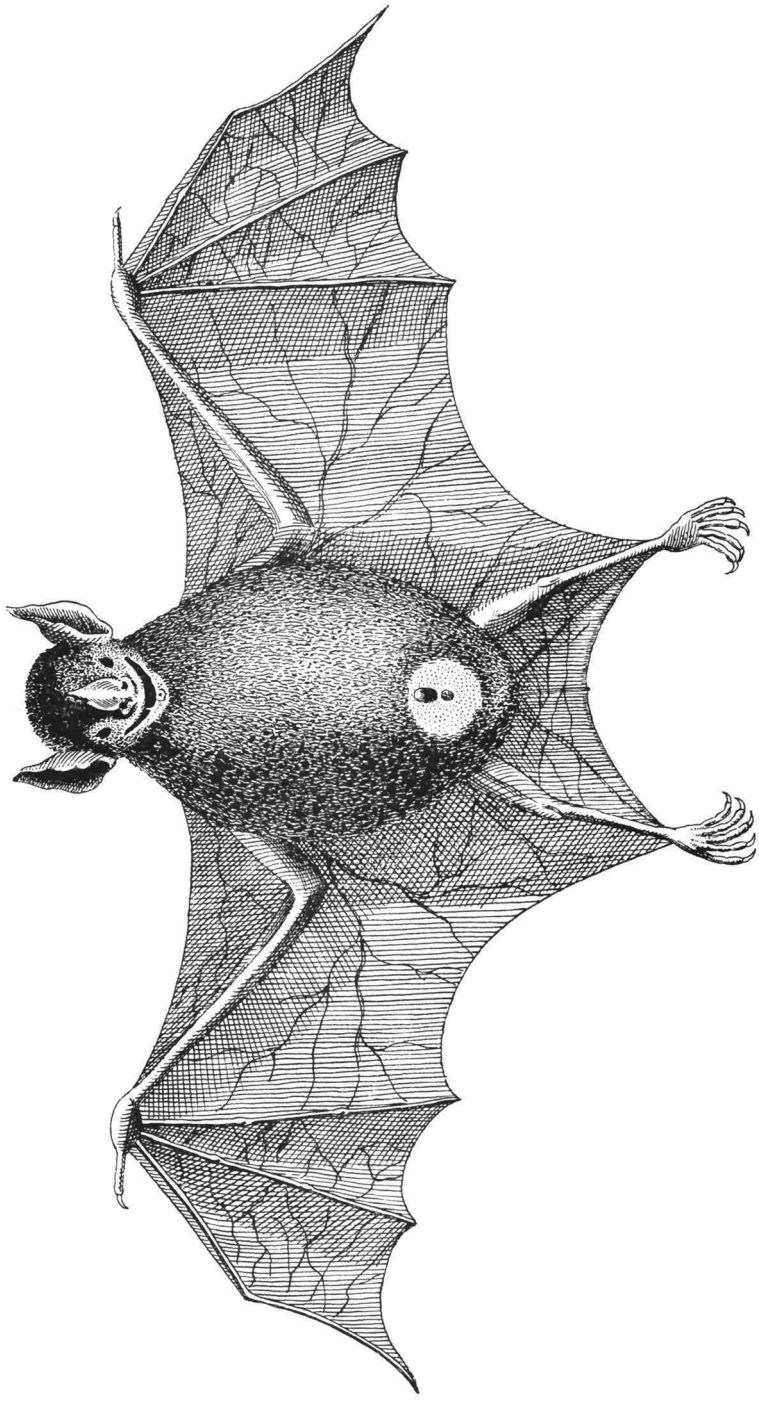

Fig. 22. Vespertilio, Americanus, vulgaris [= *Carollia perspicillata perspicillata* (L.)]. After Seba, 1734, pl. lv fig. 2. 6/7 × original size.

reg. nos. 17505, 17510, 17513, 17516, 17519, and 17521: six males; reg. nos. 17499-17504, 17506-17509, 17511, 17512, 17514, 17515, 17517, 17518, and 17520: seventeen females. All specimens are preserved in alcohol, skulls extracted.

Zanderij, south of Paramaribo; July 8, 1951, D. C. Geijskes; RMNH, reg. no. 12074: one male; reg. nos. 12071-12073, 12075-12085: fourteen females. All specimens preserved as dried skins and skulls.

Neighbourhood of Paramaribo; May 2 to May 24, 1955, C. F. A. Bruijning; RMNH, reg. nos. 17530-17534, and 17536: six males, preserved in alcohol, skulls inside; reg. no. 17527: one female, dried skin and skull; reg. nos. 17528 and 17529: two females, preserved in alcohol, skulls inside.

Neighbourhood of Paramaribo; July 16, 1955, C. F. A. Bruijning; RMNH, reg. nos. 17535 and 17377: one male and one female, preserved in alcohol, skulls inside.

Brownsweg, about 115 km S. of Paramaribo on the railroad to the interior; August 11, 1958, D. C. Geijskes and St. Ligorie; RMNH, reg. nos. 16533, 16538, 16539, and 16542: four males, dried skins and skulls; reg. nos. 16512-16514, 16531, 16532, 16534-16537, 16540, 16541, 16543-16547: fifteen females, dried skins and skulls.

Paramaribo; April 1, 1959, D. C. Geijskes; RMNH, reg. no. 17525: one female, preserved in alcohol, skull inside.

Plantation De Morgenstond, Paramaribo; 1960, P. van Doesburg; RMNH, reg. nos. 17522-17524: three females, preserved in alcohol, skulls inside.

Description. — Wied (1826, vol. 2, pp. 192-196: *Phyllostoma brevicaudum*); Peters (1865b, pp. 519-520: list of synonyms); Dobson (1878, pp. 493-495: *C. brevicauda*; pl. xxvi figs. 5 and 5a: skull); H. Allen (1890b, and 1890c); Hahn (1907, pp. 108-111; table of measurements); Miller (1907a, pp. 145-146; pls. ix and x fig. 1: right upper and right lower tooth-row, respectively, occlusal view); Vieira (1942, pp. 331-335; fig. 23: animal, ventral view); Goodwin & Greenhall (1961, pp. 249-251; fig. 51: head, front view; fig. 52: lower lip, front view; pl. 23 figs. 1-3: skull).

Length of forearm varying from about 38 to 44 mm; nose leaf well developed, about 10 mm long, the breadth of the lancet about 5 mm; ears rather short and broad, about 17 mm long and 12 mm broad, rounded above; tragus short, about one-fourth or one-fifth of the length of the ear, often hardly noticeable from the outside, with concave subterminal emargination; interfemoral membrane moderately developed, angularly emarginate behind, when stretched reaching to the distal part of the tibia; tail slender and short, scarcely reaching to the middle of the interfemoral membrane, perforating it, only the extreme portion of the tip appearing on the dorsal surface of the membrane (in dried skins the tail is often very indistinct); calcar distinct, about 6 mm long, equal to about half the length of the hind foot; wing membrane from the ankles. Fur soft and dense; dorsally extending on the wing membrane as far as a line connecting the middle of the upper arm with the distal third of the thighs; the proximal half of the forearm covered with very short hairs; short hairs also present on the basal part of the interfemoral membrane. Ventrally the membranes are less distinctly pubescent

than dorsally. The general coat colour of the dorsal surface varies from dark greyish brown to a more reddish brown with all intermediate stages; the hairs are distinctly tricoloured, since the basal third is brownish followed by a band of light yellowish or light buff, while the distal third is of about the same colour as the basal third; in most specimens, at least in the dried skins, the back of the body shows a grizzled appearance, because of the light buffy parts of the hairs. The coat colour of the ventral surface is almost uniformly greyish brown or brownish, it is not grizzled; with the exception of the slightly paler tips the hairs on the ventral surface are of the same colour throughout. The wings are dark to blackish brown or dark reddish brown.

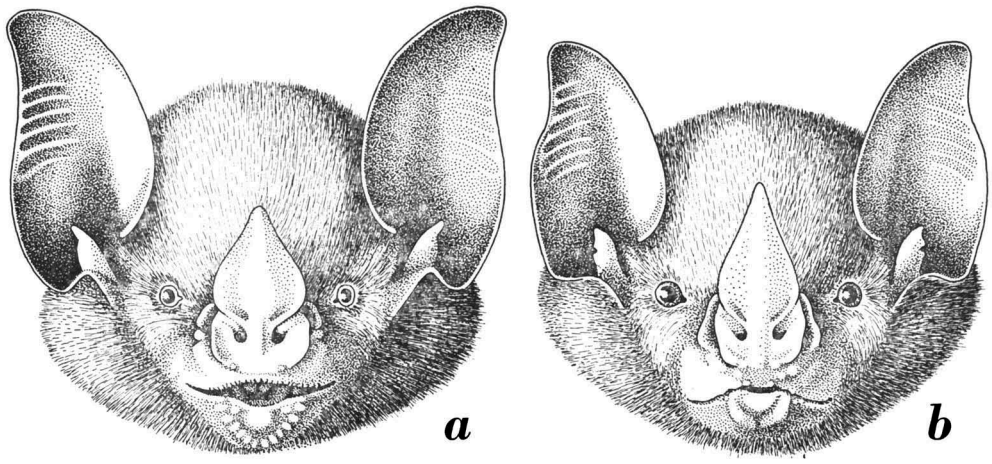

Fig. 23. a, *Carollia perspicillata perspicillata* (L.), RMNH, reg. no. 17377; b, *Rhinophylla pumilio* Peters, SMN, Nr. 289, 1.

Dental formula: $\frac{2.1.2.3}{2.1.2.3}$. Upper incisors strongly contrasting in size. The minute outer ones scarcely rise to the level of the cingulum of the canines; they are in contact with the large inner incisors and usually also with the canines (in some skulls there is a small space between the outer incisor and the canine). The first upper premolar is somewhat larger and higher than the second, touching both the canine and the second premolar; sometimes, however, it is separated by a small space from one or both of these teeth. The upper molars are narrow, without distinct W-pattern on the crowns. The lower incisors completely fill the space between the short canines, the outer is smaller than the inner. The first lower premolar is slightly larger than the second, touching both the canine and the second premolar, or is

separated from them by small spaces. The second lower premolar is slightly higher than the first molar. The skull is robust, with a rounded braincase; the zygomata are incomplete; the sagittal crest is scarcely noticeable.

The external and skull measurements of ten specimens from Suriname are given in Table XIV.

Remarks. — As far as known to me all authors follow Thomas (1911a, p. 130) in considering Seba's (1734, vol. 1, p. 90, pl. lv fig. 2) description and figure of "Vespertilio, Americanus, vulgaris" as the basis for Linnaeus's (1758, p. 31) *Vespertilio perspicillatus* (see also Thomas, 1892a, p. 315; J. A. Allen & Chapman, 1897, pp. 3-4). Seba's description (see also fig. 22 of the present paper) is as follows: "No. 2. Chauve-souris commune d'Amerique. Elle ressemble beaucoup de figure à nos Chauve-souris, excepté seulement que ses oreilles sont plus amples & plus longues, & qu'elle porte une petite crête sur le nez assez semblable à un casque. Elle n'a point de queuë; ses pieds de derriere sont deliés, mais ils ne sont pas fendus. Son poil est d'un gris de souris".

Sanderson (1938, p. 146) noted that the present species, which he collected in Suriname, cannot be kept in captivity at all: "One day a boy brought us a hundred small fruit-eating bats named *Hemiderma brevicauda*. They were placed in a large dark cage, well supplied with bananas and other fruits suspended from the roof by strings. These they devoured greedily, but they none the less died at the rate of three an hour".

In his list of Suriname mammals, Lammens (1844, p. 107) used the scientific name *Vespertilio perspicillatus* L. for his "Nr. 856. [error pro 356] Die Schaufelnase". As discussed under *Phyllostomus hastatus hastatus* (see page 109), Lammens actually gave a description of that species.

Together with *Glossophaga soricina soricina* the present species is one of the most common bats of Suriname. The two species resemble each other superficially, but the smaller size, the long tongue, and the deeply grooved lower lip of *Glossophaga* make a certain identification possible (see also p. 131). According to field notes provided by the collectors of the present Suriname material, *Carollia* is found usually roosting in colonies under bridges and culverts.

Hahn (1907) and Miller (1907a, p. 145) used the name *Hemiderma* Gervais, 1856, for the present genus. As shown by Sanborn (1949b, p. 281) the correct generic name for it actually is *Carollia* Gray, 1838.

Carollia castanea castanea H. Allen

Carollia castanea H. Allen, 1890, Proc. Amer. Philos. Soc. Philadelphia, vol. 28, pp. 19-21, fig. 1 (reprinted in: Proc. U. S. Nat. Mus. Washington, 1890, vol. 13, pp. 292-294).

TABLE XIV

External and skull measurements of ten specimens of *Carollia perspicillata perspicillata* (L.) from Suriname.

Museum	ZMH	RMNH	RMNH	RMNH	ZMH	RMNH	RMNH	RMNH	RMNH	RMNH
Reg. number	23520b	17510	17513	17521	23520a	17589	17592	17501	17514	17506
Sex	♂	♂	♂	♂	♂	♀	♀	♀	♀	♀
Forearm	40.2	41.1	41.8	40.5	41.8	39.7	41.3	39.0	41.8	40.2
Third digit, metacarpal	39	39	39.5	40.5	39.5	39.5	39	39	41.5	40
1st phalanx	15.5	16	17	16.5	17.5	16	16	17	16	17
2nd phalanx	20.5	20	21	21	22.5	20.5	21.5	20.5	21.5	22
3rd phalanx	13	12	14	16	13	12.5	15	14.5	14	12.5
Fourth digit, metacarpal	37.5	38	36	39	37.5	36	38	37.5	40	37.5
1st phalanx	12	13	13.5	13.5	13	12.5	13	14	13.5	14.5
2nd phalanx	13.5	13.5	14	15.5	13	13.5	15	14	14	13.5
Fifth digit, metacarpal	38.5	40	39.5	40	39.5	38	38.5	39	41	39.5
1st phalanx	12	12	12	12	11.5	12	12	12.5	12	13
2nd phalanx	13	12.5	13	13.5	13	12.5	13	12	13	12.5
Tibia	17	16.5	18	19	16.5	17	17.5	16	18	17
Hind foot	11.5	12	13	13	12.5	11	13	11.5	13	12
Calcar	5	6	6	6	6	6.5	7	5.5	5.5	6
Skull:										
greatest length	21.4	21.5	21.8	22.0	22.6	21.0	21.8	21.3	21.6	22.8
condylobasal length	19.3	19.5	20.2	20.2	20.8	18.9	19.8	19.5	19.6	20.5
condyle to front of canine	19.0	19.0	19.8	19.5	20.2	18.5	19.5	19.2	19.5	20.1
basal length	17.4	17.5	17.7	17.9	18.4	16.5	17.8	17.1	17.2	18.3
palatal length	9.9	10.0	9.7	10.2	10.0	9.2	10.4	9.4	9.7	10.5
zygomatic breadth	10.1	10.8	11.3	11.4	11.2	—	11.0	10.8	10.2	10.5
breadth of braincase	9.3	9.4	9.2	9.6	9.5	9.1	9.5	9.4	9.5	9.5
height of braincase	8.1	8.5	8.3	8.7	8.8	8.3	8.7	8.2	8.3	8.5
mastoid breadth	10.8	10.9	11.2	11.1	10.6	10.4	10.7	10.8	10.7	11.0
interorbital constriction	5.4	5.8	5.8	5.9	6.1	5.4	6.2	5.8	5.5	6.0
postorbital constriction	5.2	5.3	5.3	5.4	5.5	5.1	5.9	5.5	5.2	5.5
width across molars	7.1	7.6	7.5	8.1	7.8	7.1	7.5	7.6	7.3	8.0
width across cingula canines	4.6	5.0	5.1	5.3	5.1	4.8	4.8	4.9	4.9	5.1
upper tooth-row, c - m^3	7.4	7.3	7.4	7.7	7.7	7.2	7.4	7.5	7.5	7.8
lower tooth-row, c - m_3	8.1	8.1	8.2	8.6	8.5	7.8	8.1	8.1	8.3	8.5
length of mandible	14.3	14.2	14.8	14.9	15.0	14.2	14.3	14.3	14.3	15.2

Type locality. — "Costa Rica", Central America.

Distribution. — The species occurs in Central America north to southern Mexico (Oaxaca), and in South America, where it has been reported from Colombia, Ecuador, Peru, and British Guiana, being now recorded for the first time from Suriname. The typical form inhabits South America and S. E. Central America to Honduras (see Hall & Kelson, 1959, pp. 124-125; map 89; Hershkovitz, 1949, p. 441). The larger form, *Carollia castanea subrufa* (Hahn) inhabits the region west of Honduras.

Specimens examined.

Suriname; date unknown, A. Kappler; SMN, Nr. 289½, 1: one female, preserved in alcohol, skull extracted.

Jodensavanne, south of Paramaribo; May, 1954, J. Lindeman; RMNH, reg. no. 17402: one female, preserved in alcohol, skull extracted.

Description. — H. Allen (1890b, pp. 19-21; fig. 1: head, front view; 1890c, pp. 292-294); Hahn (1907, pp. 116-118); Goodwin (1942b, p. 132); Hershkovitz (1949, pp. 440-441); Felten (1956a, pp. 198-199; 211-212); Hall & Kelson (1959, pp. 123-125).

Judging by the data concerning the present species found in the literature, it seems that there is no good external character to separate *Carollia castanea* from *C. perspicillata* except for the smaller size of the former; also the skulls of both species show no other differences than the smaller size of *C. castanea*. For this reason the two Suriname specimens dealt with are considered, at least for the present, to belong to *C. castanea*. In *C. castanea* the length of the forearm varies from about 34 to 38 mm; in my specimens it is 36 and 38 mm. The skulls of my specimens are conspicuous by that the upper tooth-row, c-m^3, is much shorter compared to the same feature in my rather large series of *C. perspicillata* from Suriname. The skull of the specimen collected by A. Kappler has the longitudinal axis of the second upper premolar not in line with the first premolar and the canine, making a distinct angle in the line of the tooth-row; this character is usually mentioned as diagnostic for *C. castanea*. The Jodensavanne specimen does not show this peculiarity, but in all its dimensions it agrees better with *C. castanea* than with the typical *C. perspicillata*. Therefore, for the time being at least, both specimens are referred here to the typical *C. castanea*.

External and skull measurements of the specimens from the Stuttgart and Leiden Museums, respectively. Forearm, 36.0, 38.0; length of third metacarpal, 35.5, 36; first phalanx, 15, 16; second phalanx, 18.5, 20; third phalanx, 12, 14; length of fourth metacarpal, 34, 35; first phalanx, 12, 13.5; second phalanx, 12.5, 12; length of fifth metacarpal, 36, 36; first phalanx, 11, 11.5; second phalanx, 12, 12.5; tibia, 16, 16.5; hind foot, 11, 12.5;

calcar, 6, 5. — Skull: greatest length, 20.0, 20.8; condylobasal length, 18.2, 18.4; condyle to front of canine, 17.5, 18.0; basal length, 16.0, 16.1; palatal length, 8.7, 8.7; zygomatic breadth, 10.5, 10.4; breadth of braincase, 9.3, 9.2; height of braincase, 8.5, 8.3; mastoid breadth, 10.2, 10.6; interorbital constriction, 5.6, 5.8; postorbital constriction, 5.2, 5.6; width across molars, 7.6, 8.1; width across canines, 4.5, 4.9; upper tooth-row, c-m^3, 6.4, 6.7; lower tooth-row, c-m_3, 6.9, 7.1; length of mandible, 12.9, 13.2.

When comparing these measurements with those given in Table XIV of *C. perspicillata* the shortness of the tooth-rows of the two specimens is very striking.

Rhinophylla pumilio Peters

(figs. 12h, 18b, 23b; pl. XV)

Rhinophylla pumilio Peters, 1865, Monatsber. Akad. Wiss. Berlin 1865, p. 355.
Rhynophylla cumilis, Kappler, 1881, Holländisch-Guiana, p. 163.

Type locality. — "Angeblich Brasilien". Dobson (1878, p. 496) examined a specimen from Bahia, Brazil. Thomas (1927, p. 366) considered specimens from Bahia, Brazil, to be topotypical; Cabrera (1958, p. 77) mentioned Bahia as the type locality. Therefore Bahia, Brazil, should be considered the restricted type locality of the species.

Distribution. — The species has been reported from Brazil, British Guiana, Suriname, northern Peru, and Ecuador.

Specimens examined.

Suriname; between 1845 and 1860, A. Kappler; SMN, Nr. 289, 1 and 2: two adult females, preserved in alcohol, skulls extracted.

Berbice River, beyond Mara, British Guiana; 1893, C. G. Young; RMNH, reg. nos. 12510 and 12511: two adult females, preserved in alcohol, skulls extracted.

Description. — Peters (1865a, p. 355; 1865b, pp. 520-521); Dobson (1878, pp. 495-496; pl. xxvii fig. 1: rostrum and mandible, front view; 1a: rostrum and mandible, left side view; 1b: rostrum and mandible, occlusal view); Miller (1907a, pp. 146-147).

Length of forearm varying from 30.7 to 34.5 mm; nose leaf well developed, lancet up to 9 mm long and 4.5 mm broad; tragus small, rather broad, about one-third the ear length; interfemoral membrane moderately developed, extending as far back as the middle of the tibiae; calcar short but distinct, up to 5 mm long; no external tail; wing membranes from the side of the foot a short distance above the base of the outer toes. Dorsal surface uniformly olive-brown, the basal parts of the hairs whitish; ventral surface uniformly drab, the basal parts of the hairs whitish; colour of the wings

dark to blackish brown, strongly contrasting with the whitish metacarpals and phalanges.

Dental formula: $\frac{2.1.2.3}{2.1.2.3}$. Upper inner incisors in contact with each other, large, bilobed, contrasting strongly with the minute outer incisors; first upper

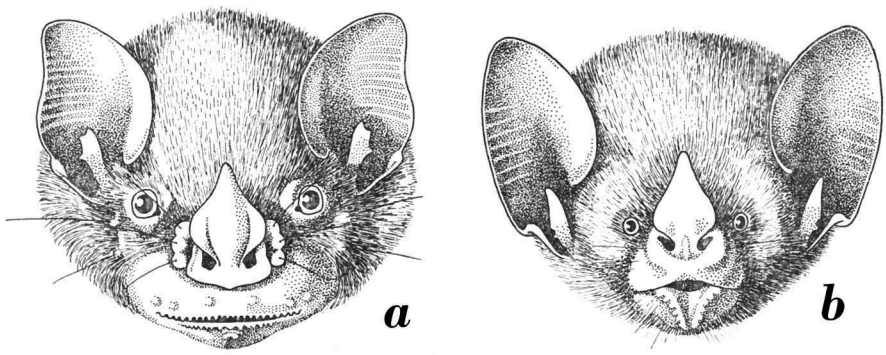

Fig. 24. a, *Ametrida centurio* Gray, SMN, Nr. 1633; b, *Glossophaga soricina soricina* (Pallas), RMNH, reg. no. 17559.

premolar small, hardly larger than the outer upper incisor, smaller than the last upper molar. Lower inner incisors distinctly trifid, larger than the outer ones; the two lower premolars nearly equal in size; zygomatic arch incompletely ossified.

The external and skull measurements of four females from the Guianas are given in Table XV.

Remarks. — The above given description of the coat colour is based on the two rather unbleached female spirit specimens from British Guiana, which were already mentioned by Jentink (1893, p. 279). Sanborn (1936, p. 100) was the first to publish measurements of the skull of the present species, these were based on two specimens, one male and one female, from Ecuador. Laurie (1955, p. 269) dealt with a male specimen from eastern Ecuador, remarking that in the British Museum there is material from Brazil and Peru, apparently the specimens dealt with by Dobson (1878, p. 496) and by Thomas (1927, p. 366).

Subfamily STURNIRINAE

The subfamily Sturnirinae differs from the other Suriname Phyllostomidae by the combination of the following characters: (1) the reduction of the interfemoral membrane to such an extent that it is hardly noticeable (fig. 1h), a fringe of long hairs indicating the place of the membrane; there

TABLE XV

External and skull measurements of four females of *Rhinophylla pumilio* Peters.

Locality	Suriname	Suriname	British G.	British G.
Museum	SMN	SMN	RMNH	RMNH
Reg. number	289,1	289,2	12510	12511
Forearm	34.4	33.4	33.7	33.2
Third digit, metacarpal	33.5	30.0	32	33
1st phalanx	14.5	14	14.5	15.5
2nd phalanx	18.5	17.5	19	18.5
3rd phalanx	11	11	11	12
Fourth digit, metacarpal	34	30.5	32.5	33
1st phalanx	12	11	12	12.5
2nd phalanx	11.5	11.5	11.5	12
Fifth digit, metacarpal	35.5	32.5	33	34.5
1st phalanx	9.5	9.5	9.5	9.5
2nd phalanx	10.5	9	11	10.5
Ear, length × breadth	14 × 9.5	11 × 8	14 × 10	13.5 × 9
Tibia	13	12	12	12
Hind foot	9	8	8	8.5
Calcar	5	3.5	3.5	3.5
Nose leaf, length × breadth	8.5 × 4.2	—	9 × 4.5	—
Skull:				
greatest length	18.2	18.0	18.7	—
condylobasal length	16.3	—	17.2	—
condyle to front of canine	15.9	—	16.6	—
basal length	14.8	—	15.3	—
palatal length	8.1	8.0	8.6	—
zygomatic breadth	9.6	—	10.0	—
breadth of braincase	8.1	8.0	8.3	—
height of braincase	7.4	—	8.2	—
mastoid breadth	8.9	—	9.2	—
postorbital constriction	5.3	5.2	5.3	—
width across molars	6.4	6.0	6.6	6.3
width across cingula canines	4.5	4.4	4.6	4.5
upper tooth-row, c - m^3	5.2	5.1	5.2	5.3
lower tooth-row, c - m_3	5.6	5.5	5.8	5.8
length of mandible	12.0	11.4	12.0	12.3

is no external tail and neither is the calcar noticeable; (2) the main portion of the crowns of the upper and lower molars is occupied by a deep longitudinal groove running from the second premolar to the last molar; (3) the hind extremities are distinctly hairy, this pubescence extends to the bases of the claws; in the males a distinct patch of stiff hairs is usually present at the front of the shoulders, its colour varying from light yellowish to dark reddish brown.

Only one species of the present subfamily is known with certainty from Suriname; this species, *Sturnira lilium* (E. Geoffroy), is represented there by the typical form. The systematic status of the described species and subspecies of the genus *Sturnira* is insufficiently clear, and the genus needs there-

fore a revision, which, according to Goodwin & Greenhall (1961, p. 252), is now undertaken by L. de la Torre.

Sturnira lilium lilium (E. Geoffroy)

(figs. 1h, 15c, 18d; pl. XVI)

Phyllostoma lilium E. Geoffroy, 1810, Annales Mus. Hist. Nat., Paris, vol. 15, pp. 181-182; 186.

Phyllostoma lilium, Kappler, 1881, Holländisch-Guiana, p. 163.

Sturnira lilium, Jentink, 1888, Mus. Hist. Nat. Pays-Bas, vol. 12, p. 210.

Type locality. — "Le Paraguay". Restricted by Cabrera (1958, p. 78) to Asuncion, the capital of Paraguay. Geoffroy based his description on D'Azara's (1801, vol. 2, pp. 277-279) "Chauve-Souris quatrième ou Chauve-souris brun-rougeâtre" from Paraguay.

Distribution. — The typical form of the present species has been reported from Paraguay, Peru, Argentina, Brazil, Suriname, Venezuela, and Trinidad, W.I. The second subspecies, *Sturnira lilium parvidens* Goldman, originally described from Mexico, occurs also in Central America, and southward to Colombia and west Venezuela, according to Hall & Kelson (1959, p. 126; map 90) it is also found on the West Indian islands Jamaica and Dominica.

Specimens examined:

Kaiserberg airstrip, Zuid River, southwestern Suriname; October 15, 1960, H. A. Beatty; CNHM, nos. 93206 and 93207: females, dried skins and skulls.

Tempati, Tempati Creek, Commewijne River basin; August 28, 1961, K. H. Voous; ZMA, no. 4469: female, preserved in alcohol, skull extracted.

Suriname; 1864, A. Kappler; SMN, Nr. 1064, 1 and 2: female and male, respectively, preserved in alcohol, skulls extracted.

Suriname; between 1824 and 1836, H. H. Dieperink; RMNH, reg. no. 13125: sex unknown, skin in very poor condition, skull inside (= Jentink's 1888 *Sturnira lilium*, no. h).

Description. — Dobson (1878, pp. 538-539; pl. xxviii fig. 5: left upper jaw; pl. xxx fig. 4: chin and nose leaf, front view); Miller (1907a, pp. 147-149; pl. iii fig. 3: right upper jaw, occlusal view; pl. iv fig. 3: right lower jaw, occlusal view); Vieira (1942, pp. 337-340; fig. 24: animal, ventral view); Goodwin & Greenhall (1961, pp. 251-252; fig. 53: head, front view; fig. 54: hind limbs, dorsal view; fig. 55: upper teeth; pl. 22 figs. 1-3: skull). D'Azara's (1801) description as well as that by Geoffroy (1810) is short and incomplete.

Length of forearm varying from 38 to 45.7 mm; nose leaf distinct, short and broad, about 7.5 mm long and 5 mm broad; ears rather short and broad, about 13 mm long and 9 mm broad; tragus short, about one-third the length of the ear; interfemoral membrane reduced to a fringe of long hairs; calcar hardly noticeable (or absent?); no external tail; wing membrane from the

distal end of the tibia or from the ankles. Fur dense and soft, extending to half the forearm and on the wing membrane as far as a line connecting the elbow and the knee; hind extremities densely furred to the base of the claws, while a dense fur consisting of fine long hairs covers the very narrow interfemoral membrane. The coat colour is subject to great variation due to sex and age, but as a general characteristic can be given: upper parts dark brown, varying from greyish to more reddish brown, the anterior part (head, neck, and shoulders) lighter, more yellowish than the posterior part, the hairs are bicoloured, the tips are dark brown, the rest is more yellowish; under parts much lighter than the upper parts and with a more greyish tinge, the anterior part more yellowish. In the males the shoulders have usually a patch of stiff hairs, varying from yellowish to reddish brown. Membranes dark brown throughout.

Dental formula: $\frac{2.1.2.3}{2.1.2.3}$. The most noticeable character is the deep, longitudinal groove on the crowns of the upper and lower molars. Upper incisors completely filling the space between the canines, the inner much larger than the outer, the latter touching the inner incisors as well as the canines; inner incisors distinctly in contact near the middle; in young adults the cutting edges are distinctly bilobed; the first upper premolar is somewhat smaller than the second, both are much higher than the more or less quadrate molars, of which the last is the smallest. Lower incisors of equal size, completely filling the space between the canines, forming a continuous row, with faintly trilobate cutting edges in young adults; first lower premolar distinctly larger than the second, about half as high as the canine; lower molars gradually diminishing in length, the first being about five times as long as the last.

The external and skull measurements of five Suriname specimens are given in Table XVI.

Remarks. — Dieperink's faded specimen is in such a poor condition that extraction of the skull, which would cause further damage, was not advisable. The length of the forearm of this specimen is about 40 mm.

The coat colour of the species varies so strongly that the various colour phases have been described as distinct species. A synonymy of the present form was given by Cabrera (1958, p. 78).

The length of the forearm of the Tempati specimen (45.7 mm) is above the range of variation of this length as given in the literature for the typical *Sturnira lilium* (38 to 43.6 mm), while the four other Suriname specimens fall within the range (40, 40.2, 41, and 41.6 mm). In contrast to the last mentioned four specimens, the Tempati specimen has the teeth strongly worn, and thus is much older. In the length of the forearm this old specimen agrees

TABLE XVI

External and skull measurements of one male and four females of *Sturnira lilium lilium* (E. Geoffroy) from Suriname.

Museum	SMN	SMN	CNHM	CNHM	ZMA
Reg. number	1064,2	1064,1	93206	93207	4469
Sex	♂	♀	♀	♀	♀
Forearm	40.2	41.6	41	40	45.7
Third digit, metacarpal	39	41	—	—	46
1st phalanx	14	15	—	—	16
2nd phalanx	19	19	—	—	21
3rd phalanx	17	17	—	—	16
Fourth digit, metacarpal	38	40.5	—	—	46
1st phalanx	12	12.5	—	—	14
2nd phalanx	15	14.5	—	—	17
Fifth digit, metacarpal	39.5	41.5	—	—	46.5
1st phalanx	8.5	9	—	—	10.5
2nd phalanx	11.5	12	—	—	14
Ear, length × breadth	13×8.5	14×9	15×—	14×—	13.5×9.5
Tibia	16.5	15.5	—	—	17
Hind foot	11.5	12	—	—	14
Skull:					
greatest length	21.6	21.9	22.1	21.6	23.1
condylobasal length	19.3	—	20.5	19.6	21.1
condyle to front of canine	18.8	—	19.6	18.8	20.6
basal length	16.5	—	17.9	17.1	18.4
palatal length	8.3	—	9.4	9.0	9.7
zygomatic breadth	13.1	—	12.7	13.3	14.3
breadth of braincase	10.1	—	9.7	9.9	10.7
height of braincase	—	—	9.2	9.4	9.1
mastoid breadth	11.4	—	11.5	11.7	12.7
postorbital constriction	5.4	6.1	5.4	5.4	6.1
width across molars	7.9	8.2	7.5	7.4	8.4
width across cingula canines	6.2	6.3	5.9	5.6	6.3
upper tooth-row, c - m^3	6.3	6.7	6.3	6.2	6.4
lower tooth-row, c - m_3	7.2	7.7	7.2	6.9	7.4
length of mandible	14.2	14.6	14.3	13.7	15.0

quite well with *Sturnira tildae* De la Torre and *S. ludovici* Anthony, species that were originally described from Trinidad, W.I., and northwestern Ecuador, respectively. The characters which distinguish these two species from each other and from *S. lilium*, according to Hershkovitz (1949, p. 442) and Goodwin & Greenhall (1961, p. 253), are mainly those of the dentition. The stage of wear of the teeth of the Tempati specimen makes it impossible to check these characters. Accordingly the identity of the Tempati specimen with *S. lilium* remains somewhat uncertain.

Subfamily STENODERMATINAE

The Suriname Stenodermatinae are characterized by the combination of the following characters: (1) muzzle short and broad, with distinct nose leaf; (2) no external tail (fig. 28c-h); (3) interfemoral membrane moderately

developed, more or less deeply emarginate behind, when the membrane is stretched the central part of its posterior margin fails to reach as far as a line connecting the ankles; (4) wing membranes from the distal part of the metatarsus near the base of the outer toes; (5) tooth-rows distinctly arcuate (pls. XVII-XX).

Some species of this subfamily are marked with a distinct longitudinal whitish line on the back of the body from about the shoulders to the caudal part of the rump, and with whitish supraorbital and infraorbital streaks, while some other species show a distinct white patch at the bases of the shoulders. These markings vary greatly within the species and may even be entirely absent.

At present nine species of Stenodermatinae are known from Suriname. It is probable, however, that also a form of the *Artibeus jamaicensis*-group occurs there; this form differs from *A. lituratus fallax* by its smaller average size, though its maximum values are overlapped by the minimum value of the latter.

The main characters for the distinction of the Suriname Stenodermatinae are mentioned in the following key.

Key to the Suriname Stenodermatinae

1. Length of forearm less than 35 mm; crown of head considerably elevated above the short muzzle 2
— Length of forearm more than 35 mm 3
2. Length of forearm varying from 24.6 to 26 mm . . . . *Ametrida minor*, p. 182
— Length of forearm varying from 31 to 33 mm . . . . *Ametrida centurio*, p. 179
3. Length of forearm more than 60 mm . . . . *Artibeus lituratus fallax*, p. 172
— Length of forearm less than 52 mm 4
4. Upper (outer and inner) incisors distinctly bilobed (fig. 26a), the inner about twice as high as the outer. Length of forearm varying from about 39 to 45 mm; whitish dorsal stripe as well as the whitish supraorbital and infraorbital streaks usually distinct . . . . . *Uroderma bilobatum bilobatum*, p. 159
— Outer upper incisors without distinct lobes 5
5. Inner upper incisors slender, much longer than broad, about three times as long as the outer incisors (fig. 26c); nasal bones absent. Length of forearm varying from 45 to 48.5 mm; ventral surface of the interfemoral membrane densely haired . . . . . *Chiroderma villosum*, p. 166
— Inner upper incisors short and broad 6
6. Length of forearm about 50 mm; inner upper incisors bilobed . *Artibeus concolor*, p. 177
— Length of forearm less than 45 mm; interfemoral membrane narrow, central part of its posterior margin reaching at most to the level of the middle of the tibiae . 7
7. A dense fur covers the legs from the tibia to the ankle as well as the whole surface of the interfemoral membrane; a fringe of hairs extends along the posterior margin of that membrane. Length of forearm about 38 mm; postorbital constriction about 7.5 mm . . . . . *Pygoderma bilabiatum*, p. 184
— Tibia and interfemoral membrane thinly haired or for the greater part naked. Postorbital constriction less than 6 mm 8

8. Inner upper incisor distinctly bilobed, about twice as long as the outer (see fig. 26d); two upper and two lower molars; length of upper tooth-row, c-m^2, less than 7 mm. Length of forearm varying from 38.7 to 43.5 mm; the posterior margin of the ventral surface of the interfemoral membrane fringed in its middle only . . . . . *Artibeus cinereus cinereus*, p. 169

— Inner upper incisor faintly trifid, much larger than the outer (fig. 26b); three upper and three lower molars; length of upper tooth-row, c-m^3, more than 7 mm. Length of forearm varying from 36.5 to 41.3 mm; the entire posterior margin of the interfemoral membrane is fringed . . . . . *Vampyrops helleri*, p. 162

Uroderma bilobatum bilobatum Peters

(figs. 25a, 26a, 28c; pl. XVII)

Uroderma bilobatum Peters, 1866, Monatsber. Akad. Wiss. Berlin 1866, pp. 394-395.

Type locality. — The original description was based on one juvenile specimen from São Paulo, Brazil, on two specimens from Cayenne, and on one animal from unknown locality. Andersen (1908b, p. 220) remarked that the type in the Berlin Museum is the specimen indicated by Peters as "ein jüngeres Exemplar aus St. Pãolo in Brasilien". Consequently the type locality must be restricted to São Paulo, Brazil.

Distribution. — The typical form occurs from Brazil and Ecuador north through the Guianas, Trinidad, Venezuela, Colombia, and Central America to Mexico. The geographic race, *Uroderma bilobatum thomasi* K. Andersen, originally described from Bolivia as a distinct species, also occurs in Peru.

Specimens examined.

Paramaribo; September 5, 1950, D. C. Geijskes; RMNH, reg. no. 13078: female, dried skin and skull; reg. nos. 13079 and 13080: two females, preserved in alcohol, skulls extracted.

Suriname; date unknown, Van Brussel; ZMA, no. 1617: female, preserved in alcohol, skull extracted.

Description. — The short original description by Peters contains the external measurements of an adult male; as already pointed out by Andersen (1908b, p. 220) the length of the second phalanx of the fourth finger as given by Peters (48 mm) must be incorrect, this dimension should be about 14 mm. Miller (1907a, pp. 154-155); Andersen (1908b, pp. 212-221; fig. 43: skull; fig. 44: right upper tooth-row and left lower tooth-row); Felten (1956a, pp. 343-346; fig. 1: head, frontal view); Goodwin & Greenhall (1961, pp. 254-255; fig. 57: head, front view; fig. 58: incisors and canines, front view; pl. 23 figs. 4-6: skull).

Length of forearm varying from 39.2 to 44.7 mm; nose leaf well developed, laterally with two rounded lobes; lancet about 11 mm long and 5 mm broad; ears longer than the nose leaf, broad, rounded off above; tragus small, the

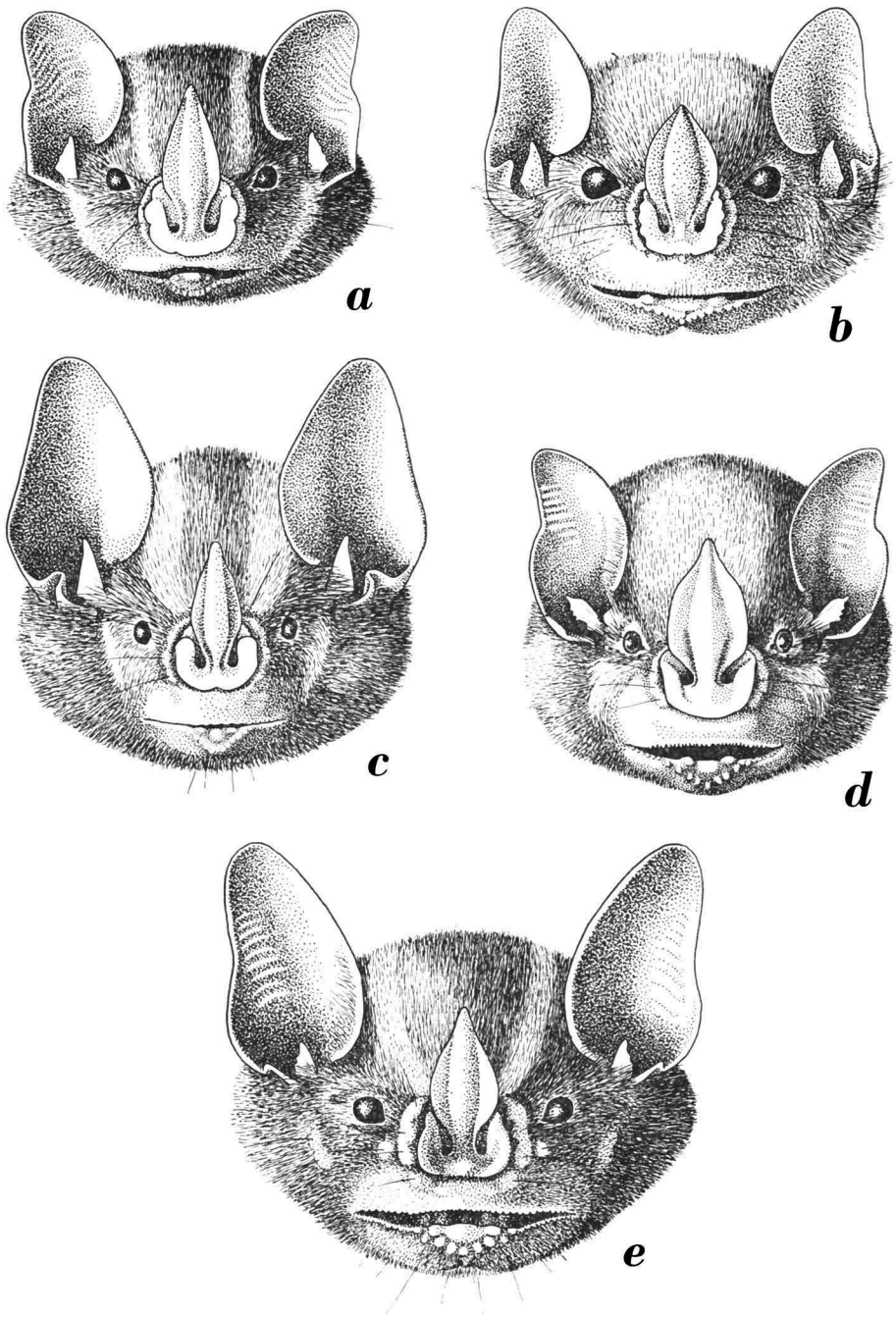

Fig. 25. a, *Uroderma bilobatum bilobatum* Peters, RMNH, reg. no. 13079; b, *Chiroderma villosum* Peters, SMN, Nr. 450; c, *Vampyrops helleri* Peters, RMNH, reg. no. 17372; d, *Artibeus cinereus cinereus* (Gervais), SMN, Nr. 861; e, *Artibeus lituratus fallax* Peters, RMNH, reg. no. 17384.

outer margin toothed; interfemoral membrane well developed, extending to about the middle of the terminal part of the tibia, angularly emarginate behind; calcar short but distinct; no external tail; wing membrane from the terminal part of the metatarsus near the base of the outer toe. Dorsal surface dull dark brown, ventral surface more light greyish brown, the anterior part above and beneath being somewhat lighter than the posterior parts; a narrow whitish stripe extends over the middle of the back from between the shoulders to the interfemoral membrane, the anterior part being sometimes very indistinct or quite obliterated; a supraorbital streak of white hairs runs from the side of the nose leaf to between the ears; there is an infraorbital white streak from the corner of the mouth to the base of the ear; fur extending to about half the forearm, above and beneath; interfemoral membrane nearly naked; white phalanges contrasting strongly with the dark brown wing membranes; margin of the ears yellowish white.

Dental formula: $\frac{2.1.2.3}{2.1.2.3}$. Upper incisors separated from each other and from the canines; upper inner incisors deeply bilobed, about twice the height of the outer, which are faintly bilobed; first upper premolar smaller than the second, often separated by a distinct space from the latter. Lower incisors small, equal in size, crowded between the canines, faintly bilobed.

For the external and skull measurements of the examined Suriname specimens see Table XVII.

Remarks. — According to the data found in the literature the present species is subject to variation in (a) the coat colour, (b) the development of the white dorsal median streak, and (c) the structure of the cutting edge of the outer upper incisors. Felten (1956a, p. 344) observed that the living animals have an olive green colour, above and beneath, which, after death, changes on the dorsal surface into Saccardo's umber and on the ventral surface into dirty greyish brown. In the Suriname material I found that also the length of the space between the first and the second upper premolars varies greatly, but in none of the four examined skulls these teeth touch each other like in the genus *Artibeus*.

The three female specimens from Paramaribo collected in September all have a well developed foetus in the uterus. According to Felten (1956a, p. 345) and Goodwin & Greenhall (1961, p. 255) gravid females are found in January and in May.

The above Paramaribo specimens were collected in a plantation where they were found hanging on the under side of a leaf of a so-called "paloeloe" tree, *Ravenala guyanensis* (L. C. Rich.).

TABLE XVII

External and skull measurements of four females of *Uroderma bilobatum bilobatum* Peters from Suriname.

Museum		RMNH	RMNH	RMNH	ZMA
Reg. number		13078	13079	13080	1617
Forearm		43	44.5	44.5	43.6
Third digit,	metacarpal	43.5	43.5	42.5	42.5
	1st phalanx	14.5	15	16	15.5
	2nd phalanx	23	23.5	23	24.5
	3rd phalanx	13.5	14	12.5	17.5
Fourth digit,	metacarpal	42	42	40.5	42.5
	1st phalanx	12	12.5	13.5	13.5
	2nd phalanx	13	14	15	14.5
Fifth digit,	metacarpal	42	42	42	43
	1st phalanx	9	10	10.5	10.5
	2nd phalanx	13.5	13.5	14	14
Ear, length		—	14.5	14	16
Tibia		—	16.5	17	17
Hind foot		—	11	11	10
Calcar		—	4.5	5.5	4.5
Lancet, length × breadth		—	11 × 5	9.5 × 4.5	11 × 5
Skull:					
greatest length		22.7	23.5	23.6	23.3
condylobasal length		20.4	21.1	21.3	21.1
condyle to front of canine		19.8	20.5	20.7	20.4
basal length		17.9	18.3	18.6	18.7
palatal length		11.0	11.4	11.4	11.6
zygomatic breadth		12.4	12.7	12.9	13.1
breadth of braincase		9.7	9.5	9.8	9.8
height of braincase		8.5	8.8	9.0	8.7
mastoid breadth		10.9	10.9	11.5	11.2
postorbital constriction		5.3	5.1	5.5	5.5
width across molars		8.7	9.1	8.9	9.1
width across cingula canines		5.2	5.2	5.5	5.4
upper tooth-row, c - m^3		7.6	7.8	8.2	7.8
lower tooth-row, c - m_3		8.2	8.5	8.7	8.2
length of mandible		14.6	15.0	15.2	15.2

Vampyrops helleri Peters

(figs. 25c, 26b, 28d; pl. XVII)

Vampyrops Helleri Peters, 1866, Monatsber. Akad. Wiss. Berlin 1866, pp. 392-394.
"Neue Gattung", Lammens, 1844, Isis 1844, p. 108.
Vampyrops lineatus, Jentink, 1887, Mus. Hist. Nat. Pays-Bas, vol. 9, p. 293; 1888, vol. 12, p. 209 (non *Vampyrops lineatus* (E. Geoffroy)).

Type locality. — "Mexico".

Distribution. — From southern Mexico through Central America into South America, southward to southeastern Peru, eastward to Trinidad, French Guiana and the Amazon region, Brazil. Sanborn (1955) gave a revision of the genus *Vampyrops* and dealt extensively with the synonymy and

the taxonomy of the present and other species belonging to that genus.

Specimens examined.

Near Sipaliwini airstrip, extreme south-western part of Suriname; February, 1961, St. Ligorie and D. C. Geijskes; RMNH, reg. no. 17372: male, dried skin and skull.

Gonggrijpstraat, Paramaribo; September 7, 1958, Radin; RMNH, reg. nos. 16510 and 16511: two males, dried skin and spirit specimen respectively, skulls extracted.

Firing-range, Paramaribo; June 29, 1959, Radin and D. C. Geijskes; RMNH, reg. nos. 16441 and 16442: two males, dried skins and damaged skulls.

Paramaribo; February, 1888, J. H. Spitzly; RMNH, reg. no. 12087: male, preserved in alcohol, skull extracted (= Jentink's 1888 *V. lineatus,* no. c).

Paramaribo; June 13, 1955, C. F. A. Bruijning; RMNH, reg. no. 17574: male, dried skin and strongly damaged skull.

Suriname; between 1824 and 1836, H. H. Dieperink; RMNH, reg. no. 12086: male, dried skin and skull (= Jentink's 1887 and 1888 *V. lineatus,* no. b).

Description. — Peters (1866a, pp. 392-394); Dobson (1878, p. 524); Miller (1907a, p. 155); Sanborn (1955, pp. 411-413); Goodwin & Greenhall (1961, pp. 255-256; fig. 59: head, front view; fig. 60: head, left side view; fig. 61: upper incisors and canines, front view; pl. 24 figs. 1-3: skull).

Length of forearm varying from 36.5 to 41.3 mm; head short and broad; nose leaf distinct, about 10 mm long and 5.5 mm broad; ears rounded, about 12 mm long and 8.5 mm broad; tragus short, about one-third or one-fourth the length of the ear; interfemoral membrane narrow, deeply concave behind, extending in the middle to the proximal part of the tibia; calcar short but distinct, about 4 mm long; no external tail; wing membranes from near the bases of the outer toes. Fur rather short and dense, extending to about the middle of the forearm above and beneath, and on both surfaces of the wing membranes as far as a line drawn from the elbow to the knee; the dorsal surface of the tibia is covered with hairs; the interfemoral membrane is thinly haired, while its posterior border is fringed with whitish hairs; the dorsal surface of the body is brownish, the hairs are light greyish brown, the extreme tips being more dark brown; the ventral surface is paler with more greyish, the chest is light greyish white; a narrow white median dorsal line extends from the crown of the head to the interfemoral membrane; the muzzle with two white streaks, one above and one below the eyes; the membranes are blackish or dark blackish brown, sharply contrasting with the whitish metacarpals and phalanges.

Dental formula: $\frac{2.1.2.3}{2.1.2.3}$. Upper inner incisors much larger than the outer, with broad oblique cusps, the cutting edges are faintly trifid or straight; the bases of the inner incisors are separated, the tips touch each other or are separated; the upper outer incisors scarcely reach to the cingulum of the canines, they are separated from that tooth as well as from the inner incisors (at least in the Suriname specimens at hand), the cutting edges are

faintly bifid or straight; the first upper premolar is smaller than the second, being about half as high; it is in contact with the canine and with the second premolar; the last molar is small, its longitudinal diameter is about one-third of that of the second molar. The lower incisors completely fill the space between the canines, forming a nearly straight row, their cutting edges are faintly bifid; the first lower premolar is smaller than the second, being about half as high as that tooth; the second lower premolar is about as high as the canine; the third molar is small, measuring about half the length of the second.

External and skull measurements of the eight examined Suriname specimens are given in Table XVIII.

TABLE XVIII

External and skull measurements of eight males of *Vampyrops helleri* Peters from Suriname in the Leiden Museum.

Reg. number	12087	12086	16510	17372	17574	16442	16441	16511
Forearm	40.2	40	39.9	38.0	39	—	40.9	40.2
Third digit, metacarpal	39	—	38	38.5	39	39	41	40
1st phalanx	14	—	13	13.5	14	14	14.5	14.5
2nd phalanx	24	—	22	22	22	22	24	22.5
3rd phalanx	14	—	10	12.5	14	15	15	15
Fourth digit, metacarpal	38	—	36	36.5	37	37	40	39
1st phalanx	12	—	11	11.5	12	11	12.5	12.5
2nd phalanx	14.5	—	14	13.5	14	13.5	15.5	15
Fifth digit, metacarpal	39	—	38	38.5	39	38.5	41	40
1st phalanx	10.5	—	9	9.5	10	9.5	10	10.5
2nd phalanx	12.5	—	11	12	13	11.5	13	13.5
Tibia	15	—	—	14	—	—	—	16
Hind foot	9	—	—	10	—	—	—	11
Calcar	3	—	—	4	—	—	—	4
Ear, length × breadth	11 × 8	—	—	14 × 10	—	—	—	12 × 8.5
Skull:								
greatest length	21.5	21.4	21.4	22.1	—	—	22.3	22.1
condylobasal length	19.2	19.3	19.4	19.7	—	—	20.2	19.7
condyle to front of canine	18.8	19.0	19.0	19.5	—	—	19.6	19.3
basal length	16.6	16.7	16.3	17.4	—	—	17.4	17.3
palatal length	9.3	10.0	9.3	10.7	—	—	10.2	10.1
zygomatic breadth	12.6	12.1	13.1	12.9	—	—	—	13.2
breadth of braincase	9.9	9.2	9.7	9.5	—	—	9.6	9.8
height of braincase	8.9	—	8.7	9.2	—	—	9.6	9.4
mastoid breadth	11.1	10.5	11.1	11.0	—	—	10.8	11.1
postorbital constriction	5.8	5.5	5.5	5.5	—	—	5.7	5.6
width across molars	9.4	8.8	9.4	9.2	—	—	9.5	9.6
width across cingula canines	5.3	5.2	5.3	5.3	5.1	5.3	5.3	5.5
upper tooth-row, c - m^3	7.8	7.7	7.8	7.7	7.6	7.7	8.1	8.2
lower tooth-row, c - m_3	8.3	8.3	8.3	8.4	8.0	8.2	—	8.7
length of mandible	14.2	14.3	14.2	14.5	—	—	—	15.0

Remarks. — The present species was reported for the first time from Suriname by Lammens (1844, p. 108), who did not give it a scientific name

but indicated it as a "neue Gattung". Lammens's diagnosis runs as follows: "Länge 2½", Flugweite 10, kein Schwanz. Färbung mausgrau, unten heller. Der Rücken ist seiner ganzen Länge nach durch eine weisse Linie wie ein Faden getheilt; auf beiden Seiten derselben ist die Färbung dunkler als am Kopf. Auf diesem sieht man einen weisslichen Stern, auf den Backen solche Flecken (vielleicht *Phyllostoma lineatum* Geoffr.)".

The measurements of the eight examined specimens of *Vampyrops helleri* from Suriname fall within the range of variation as given by Sanborn (1955, p. 412). Concerning the specimens collected by Radin on the firing-range of Paramaribo, Dr. D. C. Geijskes kindly informed me in a letter of January 24, 1959: "Volgens Radin heeft hij het paar (ze schijnen steeds in paren bijeen te zitten) gevonden in de verfrommelde afhangende oude bladeren van de wilde banaan, hier paloeloe genaamd (*Heliconia bihai*). De plekken zijn meestal donker door de onderschepping van het buitenlicht door de grote levende bladeren. Volgens Radin zouden de vleermuizen daar niet zeldzaam zijn". (According to Radin the pair (they seem to occur always in pairs) was found in the crumpled old leaves of the wild banana tree (*Heliconia bihai*), which is named here "paloeloe". These old leaves hang down, and the places where the bats are found are usually dark as the sunlight is intercepted by the large fresh leaves. According to Radin the bats are not rare in this habitat).

As characteristic for the genus *Vampyrops*, Miller (1907a, p. 155) as well as Sanborn (1955, p. 405) note that the inner upper incisors are in contact at the tips; the figure given by Goodwin & Greenhall (1961, p. 257 fig. 61) shows that the upper incisors completely fill the space between the canines and are in contact with each other. In the description of *Vampyrops recifinus*, Thomas (1901e, p. 192 footnote) noted that his new species agrees with *V. zarhinus* in having "the same minute and separated incisors". When examining the six skulls of my Suriname material in which the row of upper incisors is complete, I found that in none the tips of the inner incisors touch, while all four incisors are separated from each other, and from the canines. Therefore it seems that these characters vary strongly and have no diagnostic value.

Since *Vampyrops recifinus*, originally described by Thomas (1901e, p. 192 footnote) from Pernambuco, Brazil, is also found in British Guiana, its occurrence in Suriname is probable. This species differs from *V. helleri* by its greater size; according to Sanborn (1955, p. 413) the length of the forearm varies from 41.0 to 43.0 mm, the greatest length of the skull from 23.9 to 24.1 mm, and the length of the upper tooth-row from 8.3 to 8.9 mm.

Chiroderma villosum Peters

(figs. 25b, 26c, 28e; pl. XX)

Chiroderma villosum Peters, 1860, Monatsber. Akad. Wiss. Berlin 1860, pp. 748-754.
Chiroderma villosum, Kappler, 1881, Holländisch-Guiana, p. 163.

Type locality. — It is certain that Peters was absolutely convinced that the specimen on which he based his new species *Chiroderma villosum* originated from Brazil; not only was it mentioned in the title of Peters's 1860 paper that the collection of bats dealt with came from "Brasilien", but it was also noted after the short latin description of *Ch. villosum* (p. 748): "Habitatio: Brasilia", while furthermore on page 754 Peters remarked: "Das hier beschriebene Exemplar, ein Weibchen, stammt aus Brasilien, wahrscheinlich aus der Sello'schen Sammlung". Thomas (1891) dealt with a specimen of *Ch. villosum* from St. Esteban, Venezuela, noting that the Brazilian specimen of the British Museum described by Dobson (1878, pp. 534-535; pl. xxix figs. 2, 2a: dentition) under the name *Ch. villosum* differs, mainly by its greater size, from Peters's species. Therefore Thomas gave the new name *Chiroderma doriae* to Dobson's specimen, which originated from Minas Geraes, Brazil. Some authors, e.g., Cabrera (1958, p. 85) and Goodwin & Greenhall (1961, p. 257), now consider San Esteban, Venezuela, to be the type locality of *Ch. villosum* Peters. There are, however, no good arguments to doubt the correctness of Peters's type locality (Brazil), the more so since Handley (1960, p. 466) examined a specimen of *Ch. villosum* from Calama, Brazil.

Distribution. — The typical form of *Chiroderma villosum* has been reported from Brazil, Suriname, Trinidad, Tobago, and Venezuela. According to Handley (1960, p. 466) *Ch. jesupi* J. A. Allen, originally described from Colombia, is subspecifically different from *Ch. villosum* and identical with *Ch. isthmicum* Miller, originally described from Panama, so that *Ch. villosum jesupi* occurs from Colombia to southern Mexico.

Specimen examined.

Suriname; 1871, A. Kappler; SMN, Nr. 1450: female, preserved in alcohol, skull extracted.

Description. — Peters (1860); Thomas (1891; 1893); Miller (1907a, pp. 157-158); Goodwin & Greenhall (1961, pp. 257-258; fig. 64: head, front view; fig. 65: skull, rostrum, dorsal view; fig. 66: upper incisors, front view; pl. 25 figs. 4-6: skull). Thomas (1891, p. 882) listed the differences between *Ch. doriae* and *Ch. villosum,* but unfortunately two important misprints have crept in; in a later paper Thomas (1893, p. 187) corrected these errors.

Length of forearm varying from 45 to 48.2 mm; nose leaf well developed, lancet about 11 mm long and 6.5 mm broad; ears broad, rounded above; tragus small, about one-third the ear length; interfemoral membrane well developed, in the middle reaching to about the level of the distal end of the tibia, angularly emarginate; calcar distinct; no external tail; wing membranes from near the base of the outer toes. Fur extending to about three-fourths the forearm and on the legs, the interfemoral membrane is densely haired, also ventrally; the white supraorbital and infraorbital facial stripes and the white median dorsal streak indistinct, sometimes absent; dorsal surface of body light greyish brown, the bases and the tips of the hairs brown, the middle parts yellowish; ventral surface of body darker than the upper parts because of the longer brownish tips of the hairs.

Dental formula: $\frac{2.1.2.2}{2.1.2.2}$. The most striking character is the absence of nasal bones, their place being occupied by an emargination extending back to between the orbits. Upper incisors separated at their bases by a small space, a small space is likewise found between the upper incisors and the canines; inner upper incisors in contact with each other from about the middle of their length, about three times as high as the small outer incisors, which scarcely reach the cingulum of the inner; first upper premolar much smaller than the second, about half the height of the latter, and separated from it by a distinct space; second upper molar larger than the first. Lower incisors of about the same size, the outer slightly smaller than the inner, evenly spaced between the canines, scarcely reaching the height of the inner margin of the cingulum of the canines; first lower premolar small, placed close to the canine but separated by a distinct space from the large premolar; second lower molar about 1.5 times the length of the first.

External and skull measurements of the examined Suriname specimen; in parentheses the measurements of the type as given by Peters (1860, pp. 753-754). Forearm, 47.3 (45); length of third metacarpal, 47 (45); first phalanx, 16.5 (17); second phalanx, 26 (25); third phalanx, 20 (21); length of fourth metacarpal, 45.8 (44); first phalanx, 15 (16); second phalanx, 16.5 (18); length of fifth metacarpal, 46.5 (45); first phalanx, 11.5 (11); second phalanx, 13 (15); ear, length, 15 (16); ear, breadth, 7.5 (11); tragus, 6.5 (5.5); tibia, 18 (16); hind foot, 12.5 (13); calcar, 6.5 (7.5). — Skull: greatest length, 25.0 (25.75); condylobasal length, 22.7; condyle to front of canine, 22.1; basal length, 20.3; palatal length, 13.8; zygomatic breadth, 15.7 (16.5); breadth of braincase, 11.0; height of braincase, 9.7; mastoid breadth, 12.3 (12.3); postorbital constriction, 6.0; width across molars, 11.4; width across cingula canines, 6.1; upper tooth-row, c-m^2, 9.0;

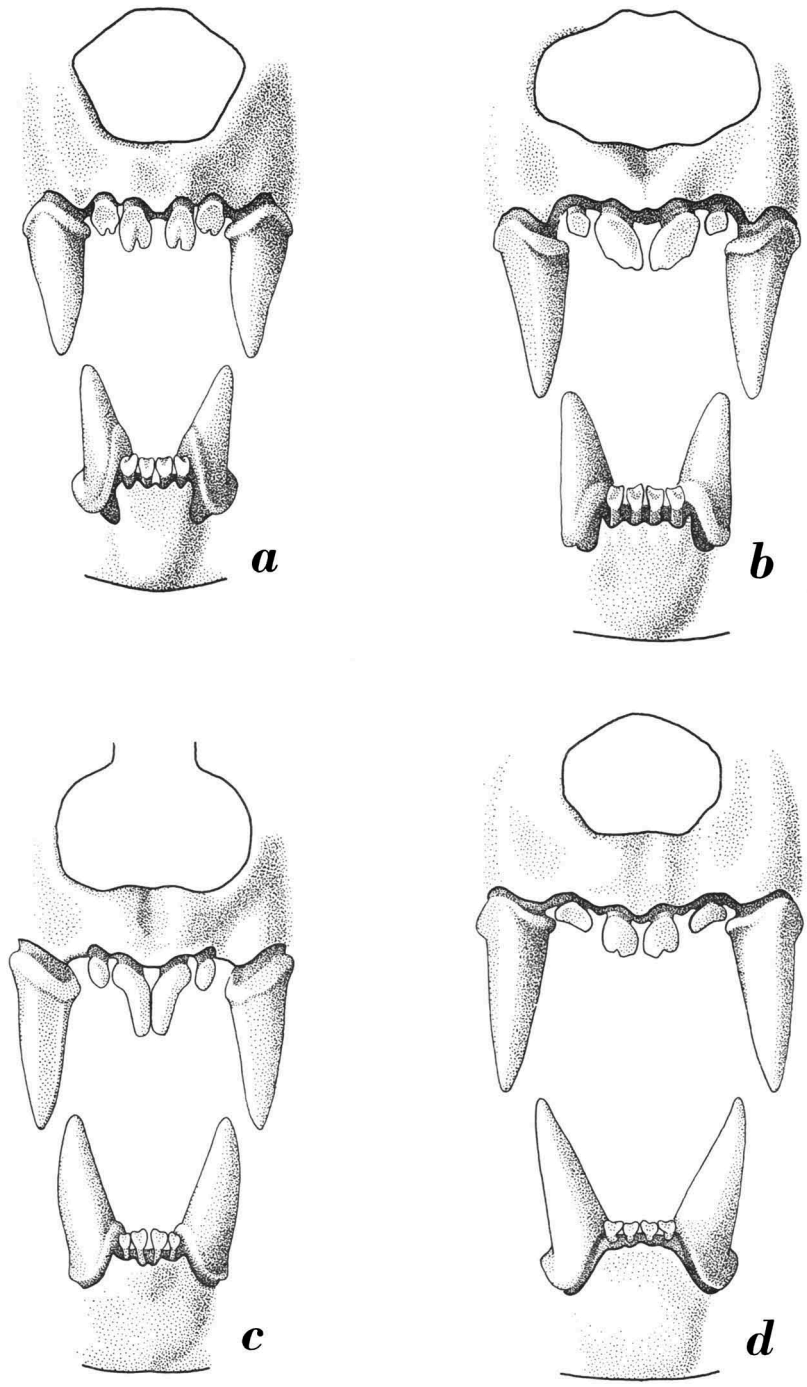

Fig. 26. Canines and incisors in front view. a, *Uroderma bilobatum bilobatum* Peters, RMNH, reg. no. 13080; b, *Vampyrops helleri* Peters, RMNH, reg. no. 16511; c, *Chiroderma villosum* Peters, SMN, Nr. 1450; d, *Artibeus lituratus fallax* Peters, SMN, Nr. 686, 1. Width across cingula canines in mm: a, 5.5; b, 5.6; c, 6.1; d, 8.6.

upper tooth-row, p^2-m^2, 6.1; lower tooth-row, c-m_2, 9.7; lower tooth-row, p_2-m_2, 6.7; length of mandible, 16.6.

Remarks. — The measurements of the examined specimen of *Chiroderma villosum* agree very well with those of four specimens from Trinidad and Tobago reported upon by Goodwin & Greenhall (1961, p. 258), while the lengths of p^2-m^2 and p_2-m_2 agree with the values (6.0 and 6.3 mm, respectively) given by Thomas (1893, p. 187) for his specimen from Venezuela.

Dr. G. H. W. Stein kindly informed me that it is questionable whether or not Peters's type is still in existence, since he could not now locate it in the collections of the Berlin Museum. In his letter of May 24, 1962, Dr. Stein wrote: "Es ist jedoch bei den alten Petersschen Typen ganz unsicher, einmal, ob sie überhaupt noch vorhanden sind und weiter, wo sie sich befinden könnten".

Artibeus cinereus cinereus (Gervais)

(fig. 25d; pl. XVIII)

Dermanura cinereum Gervais, 1856, Mammifères, in: De Castelnau, Animaux nouveaux ou rares dans les parties centrales de l'Amérique, p. 36, pl. 8 fig. 4, pl. 9 figs. 4 and 4a, and pl. 11 fig. 3.

Artibeus (Dermanura) quadrivittatus Peters, 1865, Monatsber. Akad. Wiss. Berlin 1865, p. 358.

Artibeus quadrivittatus, Dobson, 1878, Catalogue Chiroptera British Museum, p. 521.

Desmanura quadrifitatum, Kappler, 1881, Holländisch-Guiana, p. 163.

Artibeus quadrifitatus, Kappler, 1881, Holländisch-Guiana, p. 163.

Artibeus cinereus, Jentink, 1888, Mus. Hist. Nat. Pays-Bas, vol. 12, p. 209.

Artibeus quadrivittatus, Jentink, 1888, Mus. Hist. Nat. Pays-Bas, vol. 12, p. 209.

Artibeus quadrivittatus, Andersen, 1908, Proc. Zool. Soc. London 1908, p. 302.

Type locality. — The type locality of *Dermanura cinereum* Gervais is "Brésil"; restricted by Cabrera (1958, p. 87) to "Pará", mouth of the Amazon River, northeastern Brazil. The type locality of *Artibeus quadrivittatus* Peters is "Surinam".

Distribution. — The species occurs in Central America and South America from southern Mexico to the central parts of Peru, Bolivia, and Brazil (see Hall & Kelson, 1959, pp. 139-141, and map 104; Cabrera, 1958, pp. 86-88). The typical form inhabits Venezuela, Trinidad and Tobago, the Guianas, and the northeastern part of Brazil at least as far south as Pernambuco.

Specimens examined.

Suriname; between 1824 and 1836, H. H. Dieperink; RMNH, reg. no. 13114: sex unknown, holotype of *Artibeus quadrivittatus* Peters, dried skin and damaged skull (= Jentink's 1888 *A. quadrivittatus,* no. a).

Suriname; 1854, A. Kappler; SMN, Nr. 527: female, dried skin, damaged skull.

Suriname; 1855, A. Kappler; SMN, Nr. 574, 2: one female; Nr. 574, 1 and 3: two males. All specimens preserved in alcohol, skulls extracted.

Suriname; 1860, A. Kappler; SMN, Nr. 861, 1 and 2: one male and one female, respectively, preserved in alcohol, skulls extracted.

Suriname; 1888, C. Schneider; RMNH, reg. no. 13113: one male, preserved in alcohol, skull extracted (= Jentink's 1888 *A. cinereus*, no. a).

Suriname; October 27, 1909, C. Heller; ZMH, Nr. 38985: one female, preserved in alcohol, skull extracted.

Description. — Gervais (1856, p. 36; pl. 8 fig. 4: head, right side view; pl. 9 figs. 4 and 4a: teeth and skull; pl. 11 fig. 3: animal, coloured fig., ventral view); Peters (1865a, p. 358: *A. quadrivittatus*); Dobson (1878, pp. 520-521: *A. cinereus*; p. 521: *A. quadrivittatus*); Miller (1907a, pp. 160-162); Andersen (1908b, pp. 290-293: *A. cinereus*; fig. 54: right upper tooth-row, occlusal view; pp. 302-303: *A. quadrivittatus*); Vieira (1942, pp. 349-350: *A. cinereus*; pp. 350-351: *A. quadrivittatus*; fig. 26: animal, ventral view); Hershkovitz (1949, pp. 448-449: revision of *A. cinereus*-group); Goodwin & Greenhall (1961, p. 262; fig. 71: head, front view; pl. 27 figs. 1-3: skull).

Length of forearm varying from 38.7 to 44 mm; nose leaf well developed; ears rather short and broad, rounded above; interfemoral membrane narrow, deeply emarginate behind, in the centre reaching at most as far as a line connecting the middle of the two tibiae; calcar short but distinct, about 4.5 mm long; no external tail; wing membrane from near the base of the outer toe. Fur short, dense and soft, extending dorsally over the upper arm and to the basal third of the forearm; on the wing membranes a narrow hairy area borders the sides of the body; the basal fourth of the interfemoral membrane is pubescent, on the remainder of the membrane the hairs are so short and few that it gives the impression of being almost naked. On the ventral surface the upper arm and the basal third of the forearm are much less densely pubescent than on the dorsal surface; on the ventral surface of the interfemoral membrane the fur extends as a rather broad streak over the median part of the membrane from the rump to the posterior margin. The dorsal surface of the body is dark brown; the tips of the hairs are mummy brown, gradually passing into paler brown, the bases being lightest. The colour of the ventral surface is much lighter, the hairs are here uniformly light brown. On the head there are whitish supraorbital and infraorbital streaks, of which, at least in my specimens, the supraorbital is very distinct, while the infraorbital streak is faintly indicated or practically absent. The wing membranes are dark brown, the area between the third phalanges of the third and fourth digits is lighter.

Dental formula: $\frac{2.1.2.2}{2.1.2.2}$. Skull and teeth closely resemble those of *Artibeus lituratus fallax*, but the third upper and lower molars are always absent in

A. cinereus. The sagittal crest is well defined but low, about 0.1 mm high.

The external and skull measurements of eight specimens from Suriname are given in Table XIX.

TABLE XIX

External and skull measurements of eight specimens of *Artibeus cinereus cinereus* (Gervais) from Suriname. RMNH reg. no. 13114 is the holotype of *Artibeus quadrivittatus* Peters.

Museum		RMNH	RMNH	SMN	SMN	ZMH	SMN	SMN	SMN
Reg. number		13114	13113	861,1	574,1	38985	861,2	574,2	527
Sex		?	♂	♂	♂	♀	♀	♀	♀
Forearm		40	38.7	39.6	40.5	40.6	40.6	43.2	42
Third digit,	metacarpal	36	37	38	40	38.5	40	39	40
	1st phalanx	15	13	14	13	14.5	14	14	14
	2nd phalanx	19.5	19.5	21.5	22	21	21.5	21.5	22
	3rd phalanx	9	13	15	16	13	13	12	—
Fourth digit,	metacarpal	36	37.5	37	38.5	38.5	39	39.5	39
	1st phalanx	12	11	11.5	12	12.5	12.5	13	13
	2nd phalanx	14	12	14	14.5	14.5	15.5	14.5	—
Fifth digit,	metacarpal	37	38	38.5	40	39	40.5	40.5	39
	1st phalanx	10	8.5	9	9	10	10	10	9
	2nd phalanx	9	10	12	13	13	14	13	—
Tibia		—	14	13.5	14.5	14.5	15	14	—
Hind foot		—	9	10	9	10	10	10	—
Calcar		—	3	5	4.5	4.5	4	4.5	—
Skull:									
greatest length		—	18.6	20.0	20.2	18.7	19.7	20.6	—
condylobasal length		—	16.5	18.3	17.9	16.7	17.9	18.2	—
condyle to front of canine		—	16.1	17.8	17.5	16.4	17.5	17.8	—
basal length		—	14.5	16.2	15.9	14.7	15.5	16.2	—
palatal length		—	8.3	9.1	9.6	8.7	9.4	10.1	—
zygomatic breadth		—	11.3	11.7	11.6	11.3	11.7	11.8	—
breadth of braincase		—	8.7	9.2	8.7	8.6	8.6	9.1	—
height of braincase, without crest		—	7.9	8.0	8.2	8.2	8.2	8.7	—
mastoid breadth		—	10.0	10.4	10.3	9.8	10.0	10.4	—
postorbital constriction		4.4	4.5	5.0	4.5	5.0	4.6	4.6	4.9
width across molars		8.0	8.3	8.4	8.8	7.7	8.3	8.5	8.6
width across cingula canines		5.1	5.5	5.4	5.7	5.1	5.5	5.6	5.5
upper tooth-row, c - m^2		6.6	5.8	6.5	6.8	6.1	6.8	6.6	6.7
lower tooth-row, c - m_2		6.7	6.2	6.6	6.9	6.2	6.9	6.7	6.7
length of mandible		12.7	11.7	12.8	12.1	12.3	12.7	12.9	12.7

Remarks. — The holotype of *Artibeus quadrivittatus* Peters is present in the Leiden Museum under reg. no. 13114. The dried skin is strongly bleached, but in other respects rather well preserved. Peters did not examine the skull of his holotype, which was still inside when I first examined the specimen. After extracting and cleaning the skull proved to be damaged (pl. XVIII); the few measurements taken by me are given in Table XIX.

Hershkovitz (1948, p. 449) pointed to the probable identity of *Artibeus*

quadrivittatus with the typical *A. cinereus*. Though I have no Brazilian material of the genuine *A. cinereus* at my disposal, a comparison of my Suriname material with the data on the two forms found in the literature has convinced me that Hershkovitz's opinion is entirely correct.

The description of *Dermanura cinereum* Gervais in De Castelnau's "Animaux nouveaux ou rares" forms part of the fifteenth livraison, which according to Sherborn & Woodward (1901, p. 164) probably was published in 1856 and not in 1855 as noted on the title-page of this part of De Castelnau's book.

Artibeus lituratus fallax Peters

(figs. 25e, 26d, 28g; pl. XVIII)

Artibeux fallax Peters, 1865, Monatsber. Akad. Wiss. Berlin 1865, pp. 355-357.
? "Bat", Von Sack, 1810, Narrative of a voyage to Surinam, p. 254.
? "Groote Vledermuis", Von Sack, 1821, Reize naar Surinamen, vol. 2, p. 213.
Vespertilio spectrum, Lammens, 1844, Isis 1844, p. 107 (non *Vespertilio spectrum* L.).
Artibeus fallax, Kappler, 1881, Holländisch-Guiana, p. 163.
? *Artibeus perspicillatus*, Kappler, 1881, Holländisch-Guiana, p. 163.
Artibeus planirostris, Jentink, 1887, Mus. Hist. Nat. Pays-Bas, vol. 9, p. 292; 1888, vol. 12, p. 208.
Artibeus perspicillatus (p.p.), Jentink, 1887, Mus. Hist. Nat. Pays-Bas, vol. 9, p. 292; 1888, vol. 12, p. 208.

Type locality. — "Guiana" and "Surinam". Restricted here to Suriname. Several authors (Andersen, 1908b, p. 242; Hershkovitz, 1949, p. 447) mentioned "Guiana" as the type locality, but since Suriname forms part of Guiana this cannot be considered a restriction of the type locality. The first true restriction is that by Cabrera (1958, p. 89) who wrote: "Localidad tipica: Guayana, restringida aquí a Cayena, que es la localidad de *Uroderma validum*, sinónimo indudable de *fallax*". This restriction is unfortunate in so far that Cayenne was not mentioned by Peters and we do not know whether any of his specimens came from there. Cabrera's type locality restriction is now invalidated by the lectotype selection made below for the species. The locality of the lectotype is Suriname, and this thereby automatically becomes the restricted type locality.

Distribution. — The species has a wide range extending from southern Mexico through Central and South America as far south as northern Argentina, Paraguay, and southern Brazil; the species is also found in the Lesser Antilles (see Hall & Kelson, 1959, pp. 138-139, and map 103; Cabrera, 1958, pp. 89-91). The subspecies *Artibeus lituratus fallax* has been reported from the Amazon River basin, the Guianas, and Venezuela, its exact range is unknown.

Specimens examined.

Suriname; between 1824 and 1836, H. H. Dieperink; RMNH, reg. no. 13083: lectotype of *Artibeus fallax,* male, dried skin and skull (= Jentink's 1887 and 1888 *A. planirostris,* no. b); reg. nos. 13081 and 13082: paralectotypes of *A. fallax,* male and young female, respectively, dried skins, skulls inside (= Jentink's 1888 *A. planirostris,* c and d).

Suriname; between 1824 and 1836, H. H. Dieperink; RMNH, reg. no. 13085: sex unknown, dried skin and skull (= Jentink's 1888 and 1887 *A. perspicillatus,* nos. a and e, respectively).

Suriname; 1857, A. Kappler; SMN, Nr. 686, 1 and 2: one female and one male, respectively, preserved in alcohol, skulls extracted.

Suriname; 1862, A. Kappler; SMN, Nr. 993, 1 and 2: two females, preserved in alcohol, skulls extracted.

Suriname; 1862, W. J. Bresser; RMNH, reg. no. 13086: one female, preserved in alcohol, skull extracted (= Jentink's 1888 *A. planirostris,* no. m).

Suriname; date and collector unknown; RMNH, reg. no. 13084: sex unknown, skeleton (= Jentink's 1887 *A. perspicillatus,* no. a).

Suriname; date and collector unknown; RMNH, reg. no. 13096: one female, preserved in alcohol, skull extracted (= Jentink's 1888 *A. planirostris,* no. j).

Suriname; 1887, J. Th. Noordijk; RMNH, reg. nos. 13091-13094: one female, one male, and two juvenile males, preserved in alcohol, skulls extracted (= Jentink's 1888 *A. planirostris,* nos. f, g, h, and i, respectively).

Paramaribo; February, 1888, J. H. Spitzly; RMNH, reg. nos. 13087-13090: two females and two males, respectively, skulls extracted (= Jentink's 1888 *A. planirostris,* nos. o, p, q, and r, respectively).

Paramaribo; 1899, West Indian Exhibition; ZMA, no. 1647: one female, preserved in alcohol, skull extracted.

Paramaribo; August, 1911, W. C. van Heurn; RMNH, reg. no. 13095: one female, preserved in alcohol, skull extracted.

Paramaribo; March, 1930, Fr. Salesianus van Croonenburg; RMNH, reg. no. 5003: one female, skull only.

Paramaribo; August 30, 1930, Fr. Salesianus van Croonenburg; RMNH, reg. no. 5004: one male, skull only.

Paramaribo; July 14, 1944, D. C. Geijskes; RMNH, reg. nos. 7484 and 7485: two males, preserved in alcohol, damaged skulls extracted.

Galibi, mouth of the Marowijne River; November 4, 1948, Suriname Expedition 1948/1949; RMNH, reg. nos. 13103 and 13105: two males; reg. nos. 13097-13102, 13104, 13106-13109: eleven females. All specimens preserved in alcohol, skulls extracted.

Paramaribo; July 30, 1951, D. C. Geijskes; RMNH, reg. no. 12004: one male, dried skin and skull.

Ma Retraite, Paramaribo; April 23, 1955, C. F. A. Bruijning; RMNH, reg. nos. 13110 and 13111: two males, dried skins and skulls.

Mijnweg, Paramaribo; July 9, 1955, C. F. A. Bruijning; RMNH, reg. no. 13112: one female, dried skin and damaged skull.

Kwattaweg, Paramaribo; November 11, 1959, J. Belle; RMNH, reg. no. 17383: one male, preserved in alcohol, damaged skull extracted.

Paramaribo; 1960, Radin; RMNH, reg. no. 17385: one male, preserved in alcohol, skull extracted.

Sipaliwini, southwestern part of Suriname; February, 1961, St. Ligorie and D. C. Geijskes; RMNH, reg. no. 17384: one female, preserved in alcohol, damaged skull extracted.

Description. — Peters (1865a, pp. 355-357); Dobson (1878, pp. 515-517:

A. planirostris; pl. xxviii fig. 1: left upper und lower tooth-row, occlusal view; pl. xxx fig. 1: nose leaf and lower lip, front view); Miller (1907a, pp. 160-162); Andersen (1908b, pp. 242-245; p. 226: table of measurements; fig. 41: skull and teeth); Vieira (1942, pp. 344-347: *A. jamaicensis lituratus*; fig. 25: animal, ventral view); Hershkovitz (1949, pp. 446-447).

Length of forearm varying in the examined Suriname material from 60.1 to 68.4 mm (mean about 66 mm); nose leaf well developed, length of lancet about 10.5 mm, breadth of lancet about 8 mm; ears shorter than the head, broadly rounded; tragus short; interfemoral membrane moderately developed, emarginate behind, when stretched reaching to about the level of the middle of the tibiae; calcar relatively short, about 7 mm; no external tail; wing membranes from the metatarsus, nearer to the base of the outer toes than to the ankles. Fur soft, dense and short; dorsally it extends to about the middle of the forearm and on the wing membranes as far as a line connecting the elbow and the knee; the base of the interfemoral membrane is loosely haired. The ventral surface is loosely haired as far as a line connecting about the middle of the forearm and the knee, and the base of the interfemoral membrane. The general coat colour of the back of the body varies from dark greyish brown to more dark brown, the ventral surface is somewhat paler. The bases of the hairs of the dorsal surface are light greyish or light buff, followed by a broad band of darker colour, while the tips are darkest; the hairs of the ventral surface are more uniformly greyish or brownish with the extreme tips somewhat paler. The two whitish facial stripes, one above and one beneath the eye, vary greatly: in some specimens these stripes are distinct (the supraorbital stripe is usually well defined), in others weakly developed or even absent; there is no trace of a longitudinal whitish stripe on the back of the body. The wings have a broad white coloured tip, which gives this bat a characteristic appearance. The rest of the wings is dark blackish brown or more dark brown.

Dental formula: $\frac{2.1.2.3 \text{ (or } 2)}{2.1.2.3 \text{ (or } 2)}$. Outer upper incisors small, not rising to the level of the cingulum of the canines, about half as high as the inner incisors; the cutting edge of the outer incisors is entire, it is as long as that of the distinctly bilobed inner incisors; all four upper incisors are either separated from each other and from the canines by small spaces (see fig. 26d) or touch each other (see Andersen, 1908b, fig. 41d). First upper premolar, about half as high as the canine, distinctly smaller than the second premolar, touching both the canine and the second premolar; third upper molar reduced, smaller than the outer upper incisor, in some specimens even absent. Lower incisors forming a nearly straight row and completely filling the space

between the canines; they are about equal in size, with faintly bilobed cutting edges. First lower premolar triangular with its base as broad as that of the second premolar; third molar small, usually present, rarely wanting. Skull robust; sagittal crest well developed, both in males and females, its height varying from 0.3 to 0.6 mm.

The external and skull measurements of ten specimens from Suriname are given in Table XX.

Remarks. — In the original description of *Artibeus fallax,* Peters stated: "Wir besitzen ein weibliches Exemplar dieser Art in Weingeist aus Guiana, andere trockene Exemplare befinden sich im Reichsmuseum zu Leiden aus Surinam". Peters did not say how many Suriname specimens had been examined by him, and neither does Jentink (1888, p. 208) give any additional information except that under *Artibeus planirostris* he lists three dried Surinam specimens (nos. b, c, and d), one of which (no. b) being provided with the indication "*Artibeus fallax* Peters". These three specimens, which are still preserved in the collection of the Leiden Museum, all are provided with an old label with the inscription "*Artibeus fallax*". That all three specimens are syntypes of Peters's species results from a letter dated "Berlin 29.7.65" written by Peters to H. Schlegel. In this letter a list is given of the "Chiroptera des Reichsmuseum zu Leiden zur Bestimmung erhalten", of which Peters announced that they were sent back to Leiden. In this letter four dried specimens are listed under *Artibeus fallax*: "1 ♂ ad., 1 ♂, 1 ♀ juv. Surinam; Dieperink. 1 Cayenne". This proves that Peters not only has seen the Surinam specimens listed by Jentink (1888, p. 208) as nos. b, c, and d of *Artibeus planirostris,* but also a male specimen (no. e) of that species from Cayenne. Since Peters does not mention the latter specimen in his original description of *Artibeus fallax* it cannot be a type of that species, but the three Surinam specimens doubtlessly are. Until now no lectotype has been indicated for the present species, so that it seems best to select Jentink's no. b of *A. planirostris,* which at present bears the registered number 13083, as the lectotype of *Artibeus fallax* Peters. This restricts at the same time the type locality of the species to Surinam.

It is possible that Von Sack (1810, p. 254; 1821, vol. 2, p. 213) had the present species in mind when he described a second large bat as occurring in Suriname next to *Vampyrum spectrum,* but his diagnosis is too inaccurate for a certain identification; Von Sack's description may equally well be based on *Phyllostomus hastatus hastatus.*

There is little doubt that Lammens (1844, p. 107) under *Vespertilio spectrum* actually dealt with *Artibeus lituratus fallax* in stead of with *Vampyrum spectrum* (L.). Lammens's diagnosis is as follows: "Nr. 355. Die Trichter-

TABLE XX

External and skull measurements of ten specimens of *Artibeus lituratus fallax* Peters from Suriname. RMNH reg. no. 13083 is the lectotype of *Artibeus fallax*.

Museum		RMNH	RMNH	RMNH	RMNH	RMNH	RMNH	RMNH	RMNH	RMNH	SMN
Reg. number		13083	13092	13103	13105	13089	13096	13107	13100	13109	686,1
Sex		♂	♂	♂	♂	♂	♀	♀	♀	♀	♀
Forearm		65	62.7	62.8	63	66.2	65.5	65.8	65.8	66.2	68.4
Third digit,	metacarpal	60	58	59	58.5	62.5	63.5	62	60.5	63	67
	1st phalanx	18	18.5	19	19	21	21	20	19	20	24
	2nd phalanx	30	31.5	30	31	34.5	33	33	33	31	37.5
	3rd phalanx	—	21	23	23	25	25	24	24	24	24
Fourth digit,	metacarpal	57	57	58	57	60.5	64.5	61.5	59	61.5	66
	1st phalanx	15	16.5	16	17	17	18	17	16	18	19
	2nd phalanx	22	23	22	23	25.5	23	23	26	23	27
Fifth digit,	metacarpal	60	58.5	59	58.5	62.5	65.5	63.5	60.5	63	68
	1st phalanx	11	11	13	13	14	13	14	13	12	15
	2nd phalanx	17	18	18	18	20	18	19	15	18	20
Tibia		24	23	23	23	26	24	25	24	26	26
Hind foot		15	15	15	15	15	16	17	16	16	16
Calcar		6	6	8	7	8	5	6	7	6	7
Skull:											
greatest length		30.5	29.1	29.9	30.0	30.2	30.2	30.1	30.6	31.4	31.3
condylobasal length		27.3	25.9	26.6	26.8	27.2	26.8	27.1	27.7	27.7	28.5
condyle to front of canine		26.4	25.0	25.6	26.1	26.7	26.2	26.1	26.9	26.9	27.7
basal length		24.1	23.2	23.5	23.8	24.0	23.6	23.8	24.6	24.7	24.9
palatal length		15.6	14.1	14.6	14.1	14.8	14.9	14.8	15.2	15.1	15.0
zygomatic breadth		18.2	18.4	18.4	19.2	18.7	19.4	19.0	19.6	19.2	19.3
breadth of braincase		12.9	12.9	13.1	13.4	13.4	13.5	13.1	13.8	13.6	13.4
height of braincase, without crest		11.3	11.8	11.5	11.8	11.6	12.0	11.2	12.0	12.0	12.0
mastoid breadth		16.4	16.0	16.4	16.8	16.5	17.0	16.3	16.7	16.7	17.0
postorbital constriction		7.4	7.3	7.9	7.2	7.3	7.6	7.2	7.7	7.2	6.3
width across molars		13.8	13.3	13.3	13.1	13.8	14.0	14.2	14.3	13.8	14.8
width across cingula canines		8.7	8.5	8.2	8.5	8.6	8.6	8.9	9.1	9.0	8.6
upper tooth-row, c - m^2		11.2	10.6	11.2	10.8	10.9	11.0	11.0	11.3	11.3	11.2
lower tooth-row, c - m_2		11.8	11.7	12.3	11.5	11.8	11.6	12.1	12.2	12.4	12.2
length of mandible		21.4	19.6	20.3	20.3	20.6	20.3	20.7	21.1	21.5	21.9

nase, Zimmermann p. 490.; *Vespertilio spectrum* Linne; — Vampyre Buffon XXII. p. 118. fig. Dieser Vampyre ist 3″ lang, Flugweite 17, und hat keinen Schwanz. Färbung mausgrau; an beiden Seiten des Kopfes und über den Augen ein graulicher Schein; an der Spitze der Flügel ein weisslicher Flecken, oder vielmehr, sie endigen mit einer weisslichen Spitze, ungefähr ½″ breit. Das Weibchen ist etwas gedrungener, als das Männchen. Sein Bauch schwärzlichbraun, der des Männchens graulich; die Ohren behaart mit kleinen Deckeln. Buffon's Fer de lance stimmt in der Grösse mit der Gattung, die ich beschreibe, überein: es scheint aber, wenn ich mich nicht irre, Buffon habe nicht bemerkt, dass die Spitze der Flügel weisslich ist". The size of the animal, its colour, and especially the distinctly whitish tipped wings indicate that Lammens's specimens belong to the present species.

The four white facial stripes are variable in the Suriname specimens: in some specimens they are very distinct, in others hardly visible or wanting. Also the coat colour is subject to variation, of which Andersen (1908b, p. 236: *A. planirostris*) already remarked: "Thus there are three stages of colour: a dark and dull smoky brown, a dark brown, and a Prout's brown; the two former come very near to each other, the third, when fully developed, is different at a glance. The first is confined to the immature age; the second is characteristic of a majority of adults; the third seems to occur only in some fully adult and aged individuals". This statement is fully confirmed by the Suriname material at hand.

As to the presence of the small third upper molar, in my Suriname material I found that in 26 of 34 skulls this molar is present, in 7 skulls it is absent, while in one skull it is present on one side of the upper jaw only. The small third lower molar is present in all skulls examined.

The specimens from Galibi were found hanging in a cluster of 16 specimens on the under side of a leaf of a coconut palm, and were killed with one shot. One female of this cluster (RMNH, reg. no. 13099) had a well developed foetus in its uterus; the date, November 4, is interesting, since Goodwin & Greenhall (1961, p. 261) noted gravid females of *Artibeus lituratus palmarum* in Tobago material from "March, April, May, June, and July".

Pending a revision of the genus *Artibeus* I adopt Hershkovitz's (1949, pp. 446-447) division of the genus, which, at least for the species occurring in Suriname, proves to be more satisfactory than that of Andersen (1908b).

Artibeus concolor Peters

Artibeus concolor Peters, 1865, Monatsber. Akad. Wiss. Berlin 1865, pp. 357-358.

Type locality. — "Paramaribo (Surinam)".

Distribution. — Since the publication of the original description the species has been reported from the Upper Amazons (Dobson, 1878, p. 518), and from Pará, Brazil (Thomas, 1901e, p. 191).

Specimens examined. — None.

Description. — Peters (1865c, pp. 357-358); Dobson (1878, p. 518); Andersen (1908b, pp. 232-234, and 246: measurements). The original description is rather short, and contains a few external measurements only; some skull measurements of the type have been published by Thomas (1892b, p. 409 footnote).

From the data found in literature it appears that *Artibeus concolor* agrees most closely with *A. lituratus fallax* Peters, but is much smaller, the length of the forearm in the former species being about 50 mm, in the latter about 66.5 mm, while the length of the tooth-row, c-m^2, varies in *A. concolor* from 7.2 to 7.5 mm, in *A. fallax* from 10.4 to 11.2 mm.

The following external and skull measurements of the adult female are given by Andersen (1908b, p. 246: table); in parentheses the measurements of the type as given by Petersen and Thomas. Forearm, 50 (47); length of third metacarpal, 46.7; first phalanx, 16; second phalanx, 24; third phalanx, 13.2; length of fourth metacarpal, 45; first phalanx, 13.2; second phalanx, 16.2; length of fifth metacarpal, 45.2; first phalanx, 11.5; second phalanx, 13.2; ear, length, outer margin, 17.7 (16); ear, breadth, 14; tragus, 6; nose leaf, lancet, length × breadth, 9.8 ×6 (nose leaf, total length, 12.5); tibia, 18.6 (18); hind foot, 11.8; calcar, 6.8; (depth of interfemoral membrane, 16). — Skull: greatest length to front of canine, 22.4; mastoid breadth, 11.8; breadth of braincase, 10.3; zygomatic breadth, 14; width across m^1, 9.4; (breadth of palate outside m^1, 9.9 or 10); width across cingula canines, 6.4; upper tooth-row, c-m^2, 7.2 (7.5); lower tooth-row, c-m_2, 8; length of mandible, 14.8.

Remarks. — More than 50 years after Andersen's 1908 revision of the genus *Artibeus,* his remark on *A. concolor* still holds good: "*A. concolor* seems to be very rare in collections, the type in the Berlin Museum, two specimens in the British Museum, and one in the Para Museum, being, to my knowledge, the only examples on record". Andersen noted further on page 234 that he has not been able to find in the British Museum the Upper Amazons specimen catalogued by Dobson (1878, p. 518). It is unknown whether or not the type is still present in the Berlin Museum; Dr. G. H. W. Stein, to whom I am very grateful for his efforts to locate the specimen, so far was not successful. In my Suriname material the present species is not represented; neither did Vieira (1942, p. 349) find new material from Brazil.

Ametrida centurio Gray

(figs. 24a, 27b, 28f; pl. XIX)

Ametrida centurio Gray, 1847, Proc. Zool. Soc. London, vol. 15, p. 15.
Ametrida centurio, Kappler, 1881, Holländisch-Guiana, p. 163.
Ametrida centurio, Jentink, 1888, Mus. Hist. Nat. Pays-Bas, vol. 12, p. 209.
Ametrida centurio, Husson, 1959, Arch. Néerl. Zool., vol. 13, suppl. 1, 1958, p. 115.

Type locality. — "Pará, Brazil".

Distribution. — The species has been recorded from Brazil (Pará; Obidos, Amazonas), Suriname, Venezuela (Caripito), and Trinidad, W. I.

Specimens examined.

Suriname; before 1866, collector unknown; RMNH, reg. no. 13074: male, dried skin in poor condition, damaged skull extracted (= Jentink's 1888 *Ametrida centurio,* no. a).
Suriname; 1877, A. Kappler; SMN, Nr. 1633: female, preserved in alcohol, skull extracted.

Description. — The original description of *Ametrida centurio* is contained in vol. xv (p. 15) of the Proc. Zool. Soc. London, which according to Waterhouse (1893, p. 438; see also Duncan, 1937, pp. 70, 80) was published on April 13, 1847. Exactly the same description was given in the Annals and Magazine of Natural History (vol. 19, p. 407), which bears the date June, 1847. Peters (1866a, pp. 396-398) and Dobson (1878, pp. 530-531; pl. xxx fig. 2: head, front view) gave excellent descriptions, the former based himself on the specimen of the Leiden Museum, the latter on the type present in the British Museum. Miller (1907a, p. 171); Goodwin & Greenhall (1961, pp. 265-266; fig. 76: head, front view; fig. 77: skull, ventral view; pl. 29 figs. 4-6: skull).

Length of forearm varying from 31 to 32.9 mm; nose leaf well developed, short and broad; ears shorter than the head, rounded above, up to 12 mm long and 9.5 mm broad; tragus small, acutely pointed, the outer margin with four prominent tooth-like projections; crown of head greatly elevated above the face-line; interfemoral membrane moderately developed, angularly emarginate behind to about the level of the middle of the tibia; calcar short but distinct; no external tail; wing membrane from near the base of the outer toes. Dorsal surface dark brown, darkest on rump, much paler on shoulders and head; ventral surface more greyish brown; a conspicuous patch of pure white hairs on each shoulder at the origin of the antebrachial membrane; a smaller and indistinct whitish spot may be present below the base of the ear.

Dental formula: $\frac{2.1.2.3}{2.1.2.3}$. Upper incisors evenly spaced between the canines; the inner upper incisors conspicuously larger than the outer; first upper

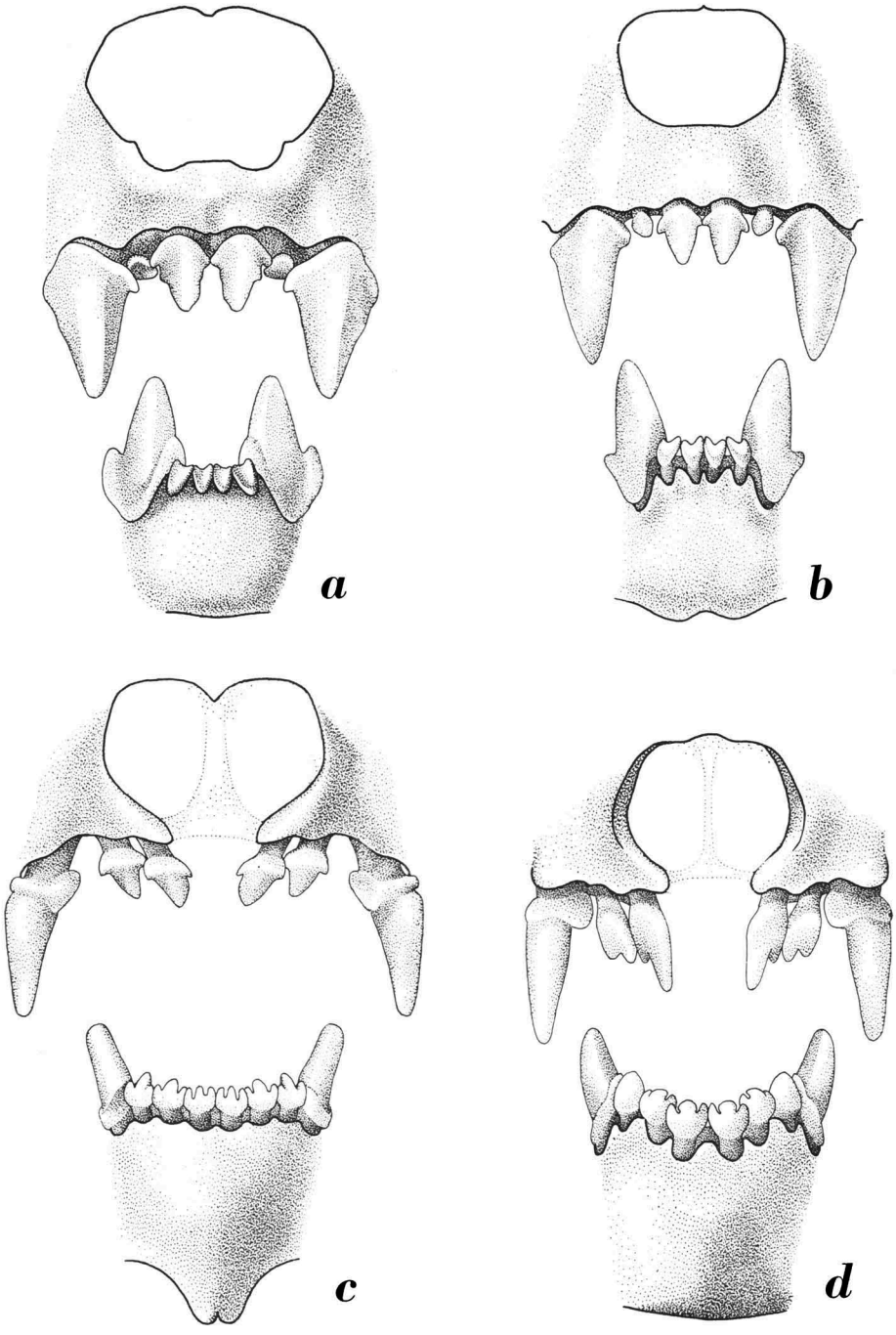

Fig. 27. Canines and incisors in front view. a, *Pygoderma bilabiatum* (Wagner), RMNH, reg. no. 17392; b, *Ametrida centurio* Gray, SMN, Nr. 1633; c, *Furipterus horrens* (F. Cuvier), SMN, Nr. 684; d, *Thyroptera tricolor tricolor* Spix, SMN, Nr. 1302, 2. Width across cingula canines in mm: a, 6.4; b, 4.5; c, 2.8; d, 2.9.

premolar smaller than the second, about half its height; third upper molar minute. Lower incisors small, of about equal size, crowded between the canines, with a deep notch in the middle; lower premolars of about equal size; last lower molar minute.

TABLE XXI

External and skull measurements of two specimens of *Ametrida centurio* Gray and of three specimens of *A. minor* H. Allen.

	Ametrida centurio		*Ametrida minor*		
Locality	Suriname	Suriname	Suriname	Suriname	Bonaire
Museum	SMN	RMNH	RMNH	CNHM	ZMA
Reg. number	1633	13074	12512	93204	2346
Sex	♀	♂	♂	♂	♂
Forearm	31.0	32	25.9	25	24.6
Third digit, metacarpal	30.5	30.7	26	—	25
1st phalanx	10	10	9	—	9
2nd phalanx	16	17.5	14	—	13.5
3rd phalanx	12.5	12.5	13	—	12.5
Fourth digit, metacarpal	26.5	26.7	23.5	—	22.5
1st phalanx	11.5	12	9.5	—	10
2nd phalanx	16.5	17.3	13	—	14.5
Fifth digit, metacarpal	27.5	27.6	24.5	—	23.5
1st phalanx	11	10.5	9.5	—	9.5
2nd phalanx	13	14.4	10.5	—	12.5
Ear, length × breadth	12 × 9.5	11.5 × 9.5	8.7 × 6.5	—	—
Tibia	14	14.5	15	—	14.5
Hind foot	8	9	9	—	9
Calcar	3.5	4	5	—	5
Nose leaf, length × breadth	7.5 × 3.5	6.5 × —	—	—	5.9 × 5.3
Skull:					
greatest length	15.6	—	14.9	14.5	14.7
condylobasal length	13.2	—	11.9	12.0	11.8
condyle to front of canine	13.1	—	11.9	11.8	11.7
basal length	11.1	—	10.0	10.0	10.0
palatal length	5.3	—	4.6	4.3	4.6
zygomatic breadth	10.8	11.0	10.4	10.6	10.1
breadth of braincase	8.6	—	8.3	8.5	8.1
height of braincase	7.8	—	8.2	8.3	7.7
mastoid breadth	9.2	—	8.8	9.2	8.8
interorbital constriction	3.8	4.1	3.3	3.4	3.3
width across molars	7.6	7.7	7.4	7.2	7.1
width across cingula canines	4.5	4.5	4.0	4.3	4.1
upper tooth-row, c - m^3	4.5	4.7	4.3	4.2	4.2
lower tooth-row, c - m_3	4.9	5.2	4.7	4.7	4.6
length of mandible	9.1	9.4	8.5	8.4	8.3

The external and skull measurements are given in Table XXI. Because the Leiden specimen (reg. no. 13074) is in a very poor condition, Peters's (1866a, pp. 397-398) external measurements are given here.

Remarks. — In the two bleached skins of *Ametrida centurio* examined by me, there is an indication that a small spot of whitish hairs is present on

the ventral surface below the ears as can also be observed in *Ametrida minor* H. Allen and in *Sphaeronycteris toxophyllum* Peters. As pointed out by Husson (1959, p. 115) the size of this spot, at least in *Sphaeronycteris,* is subject to great variation, being more distinct in some specimens than in others. Peters, Dobson, and Goodwin & Greenhall in their descriptions of the present species do not mention the presence of this small spot, it would be of interest to determine whether or not this character indeed may be entirely absent in some specimens of *A. centurio.*

For unknown reasons Peters (1866a, pp. 396-398) did not mention the locality of the Leiden specimen of *A. centurio,* though this locality, Suriname, is clearly indicated on the label and as such was given by Jentink (1888, p. 209). So far skull measurements have been published of only three specimens of the present species, viz., by Sanborn (1938, p. 5) and by Goodwin & Greenhall (1961, p. 266).

A discussion about the relation between *A. centurio* and *A. minor* is given under the latter species; for the characters in which the skull of *A. centurio* differs from that of *Sphaeronycteris* see Husson (1959, pp. 116-118).

Ametrida minor H. Allen

(pl. XIX)

Ametrida minor H. Allen, 1894, Proc. Boston Soc. Nat. Hist., vol. 26, pp. 240-246; fig. 1: head, front view; figs. 2-4: skull.
Ametrida minor, G. M. Allen, 1902, Proc. Biol. Soc. Washington, vol. 15, pp. 88-89.
Ametrida minor, Husson, 1959, Arch. Néerl. Zool., vol. 13, suppl. 1, 1958, p. 115.

Type locality. — In the original description the type locality was stated to be unknown, but in a later publication G. M. Allen (1902) showed that the type specimen originated from Suriname, probably from the neighbourhood of Paramaribo. Paramaribo may therefore be considered the restricted type locality of the species.

Distribution. — The present species has been recorded from Suriname, from British Guiana (Kartabo), and from the Netherlands Antilles (Bonaire Island).

Specimens examined.

Moengo, about 85 km east of Paramaribo; April 1953, D. C. Geijskes; RMNH, reg. no. 12512: male, skin and skull.

Kaiserberg Airstrip, Zuid River, southwestern part of Suriname; November 4, 1960, H. A. Beatty; CNHM, no. 93204: male, skin and skull.

Kralendijk, Bonaire, Netherlands Antilles; October 1958, F. C. A. Chirino; ZMA, no. 2346: male, preserved in alcohol, skull extracted.

Description. — In all essential characters *Ametrida minor* agrees very well

with *A. centurio,* but on the whole it is distinctly smaller. The length of the forearm varies from 24 to 25.9 mm. The calcar of *A. minor* is not only relatively, but also absolutely longer than in *A. centurio.* In the original description H. Allen (1894) remarked that the colouration is almost white. It is likely, however, that Allen's type had lost its original colour since at the time of the description the specimen had been preserved in alcohol for about sixty years. In the three specimens examined by me, the dorsal surface is of a dull brown colour, about intermediate between Ridgway's mummy-brown and sepia. This colour is lighter in the anterior than in the posterior part of the dorsal surface, the difference mainly being caused by the fact that in the anterior region the hairs are bicoloured, having the basal two-thirds whitish, while on the rump the hairs are practically uniformly brown. The ventral surface is greyish brown, slightly darker in the posterior than in the anterior region. A very conspicuous feature is the presence of a well-defined patch of pure white hairs on the shoulders near the base of the humerus; a smaller and inconspicuous spot of whitish hairs is found below the ear on the neck. As on the dorsal surface, the hairs of the anterior ventral region are bicoloured, having the basal two-thirds whitish, while those of the posterior part are of a practically uniform greyish brown tinge. The fur extends on the antebrachium, on the proximal half of the forearm, above and beneath, and on the wings from half the forearm to the proximal third of the tibia. The interfemoral membrane is thinly haired, above and beneath, the free margin being thinly fringed. The ears and the wings are naked, the former are light brown, the latter darker to blackish brown.

Dental formula: $\frac{2.1.2.3}{2.1.2.3}$. The skull characters are essentially like those of *Ametrida centurio.* The upper incisors are separated from one another and from the canines by a small space.

The external and skull measurements are given in Table XXI.

Remarks. — According to the collector's note the Moengo specimen was captured indoors; also the Bonaire specimen was caught after it had flown into a house.

As far as known to me the second and the third specimen reported upon after the original description are those mentioned by Husson (1959, p. 115; 1960, pp. 72-74; 155; fig. 16: head, front view and lateral view; pl. 14: skull) from Suriname and Bonaire. Goodwin & Greenhall (1961, p. 266) recorded a specimen from Kartabo, British Guiana, of which they gave the length of the forearm as 24.8 mm, and provided also skull measurements.

Though there is a remarkable difference in the length of the forearm of *A. minor* and *A. centurio,* it appears that not all dimensions of *A. minor*

are proportionally smaller than in *A. centurio*. As a whole the ratios between the length of the forearm and the other dimensions are smaller in *A. minor* than in *A. centurio*, in other words these dimensions in relation to the length of the forearm are greater in *A. minor* than in *A. centurio*. However, with the material at hand it is not possible to decide the question in which way the differences in the ratios are of diagnostic value.

The genus *Ametrida* is closely related to the monotypical genus *Sphaeronycteris*; the striking differences in the skull of the two genera are dealt with by Husson (1959).

Pygoderma bilabiatum (Wagner)

(figs. 27a, 28h; pl. XX)

Phyllostoma bilabiatum Wagner, 1843, Arch. Naturgesch., vol. 9, pt. 1, p. 366.
Stenoderma (*Pygoderma*) *microdon* Peters, 1863, Monatsber. Akad. Wiss. Berlin 1863, pp. 83-85.

Type locality. — "Ypanema", São Paulo State, Brazil. The type locality of *Stenoderma microdon* is "Surinam".

Distribution. — The present species is restricted to eastern tropical South America from Paraguay and eastern Brazil to Suriname. As pointed out by Koopman (1958) the record of the species from Mexico mentioned by several authors is due to a misinterpretation of Peters's 1863 paper.

Specimens examined.

Brazil; date unknown, Brandt; RMNH, reg. nos. 17391 and 17392: male and female, dried skins, skulls extracted (= Jentink's 1887 and 1888 *P. bilabiatum*, nos. a and b); reg. no. 17393: male, dried skin only (= Jentink's 1888 *P. bilabiatum*, no. c).

Description. — Wagner (1847, pp. 173-175); Peters (1863, pp. 83-85); Dobson (1878, pp. 536-537; pl. xxviii figs. 4, 4a and 4b: teeth; pl. xxx fig. 3: head, front view); Miller (1907a, pp. 166-168; fig. 23: skull); Vieira (1942, pp. 364-366; fig. 28: animal, ventral view; pl. iii fig. 19: skull, right side view). The original description by Wagner is extremely short; in his 1847 paper he dealt more extensively with this species.

Length of forearm about 38 mm; nose leaf well developed, about 12.5 mm long and 8.5 mm broad, resembling that of *Artibeus cinereus*; ears rather broad, rounded above, about 17 mm long and 11.5 mm broad; tragus small; interfemoral membrane moderately developed, circularly emarginate, if stretched reaching to about the middle of the tibia; calcar small but distinct, about 5 mm long; no external tail; wing membrane from near the base of the outer toe. Hairs rather long, dense and soft, dorsally the bases of the hairs are dark brown, the middle part pale buff, the tips dark brown; ventrally the hairs

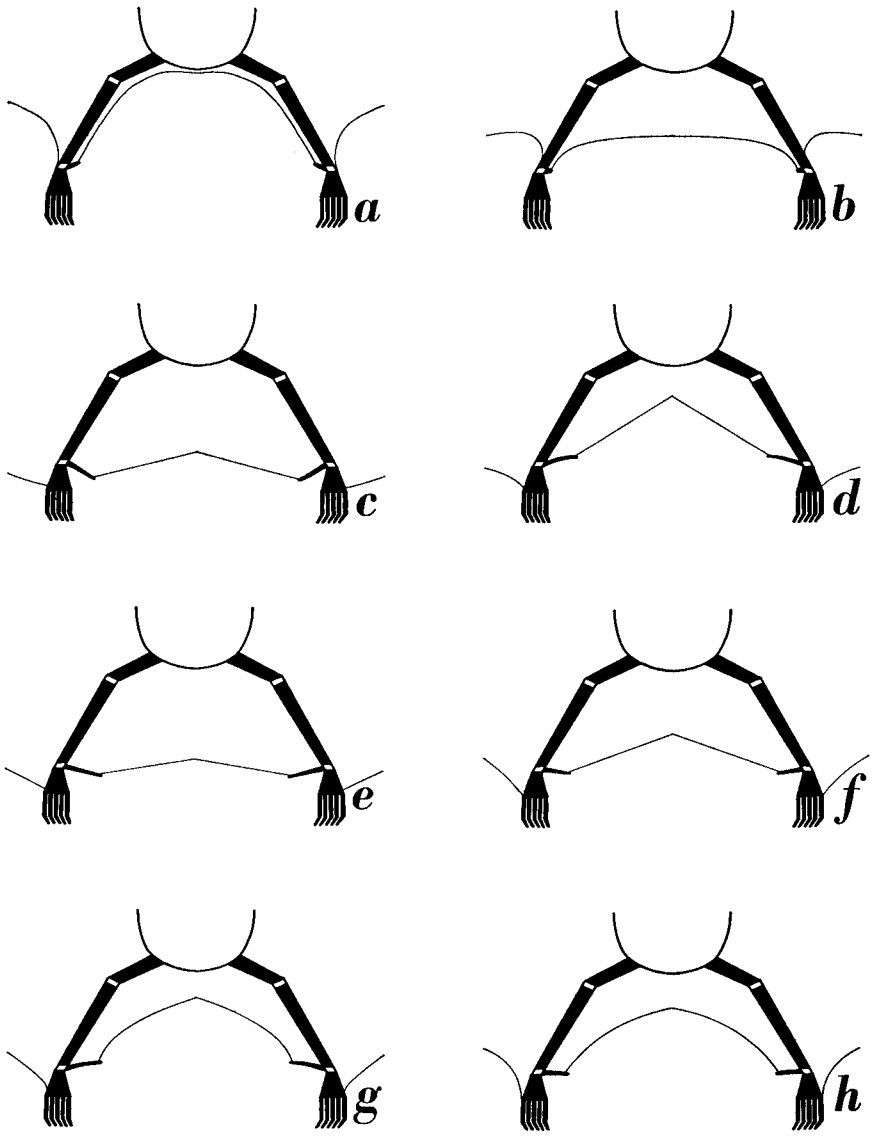

Fig. 28. Diagrams of interfemoral membranes, ventral view, showing the various forms to be observed in Suriname Glossophaginae(a), Desmodidae(b), and Stenodermatinae (c-h). a, *Anoura geoffroyi geoffroyi* Gray; b, *Diaemus youngii youngii* (Jentink); c, *Uroderma bilobatum bilobatum* Peters; d, *Vampyrops helleri* Peters; e, *Chiroderma villosum* Peters; f, *Ametrida centurio* Gray; g, *Artibeus lituratus fallax* Peters; h, *Pygoderma bilabiatum* (Wagner).

are uniformly greyish brown; heavy fur on the upper arm and on the proximal three-fourths of the forearm, ending there rather abruptly; on the wing membranes above and beneath the fur extends to a line connecting the distal fourth of the forearm with the knees; the legs and the interfemoral membrane are densely furred, the former to the ankles, the latter on its whole surface with a fringe along the posterior margin; a small patch of white hairs is present on each shoulder, at the origin of the antebrachial membrane.

Dentition: $\frac{2.1.2.2}{2.1.2.2}$. Upper incisors completely filling the space between the canines, the inner are conspicuously larger than the very small outer, which scarcely reach above the gum, the former in contact basally, their tips being wide apart; the outer side of the inner incisors with a secondary cusp near the middle; upper premolars nearly equal in size, the first a shade smaller than the second; first upper molar slightly longer than the second premolar; second upper molar about one-third of the length of the first. Lower incisors forming a continuous row between the canines, they are equal in size, deeply grooved above and on the front; lower premolars equal in size, slightly shorter than the canines; first lower molar somewhat larger than the premolars, the second molar being about one-third the size of the first.

The following are the external and skull measurements of two Brazilian specimens (RMNH, reg. nos. 17391 and 17392, respectively); in parentheses some of the measurements of the type of *Pygoderma microdon* are given as these were published by Peters in 1863. Forearm, 38, 38, (38); length of third metacarpal, 39, 37; first phalanx, 18, 17; second phalanx, 26, 27; third phalanx, 12, 10, (total length of third digit, 89); length of fourth metacarpal, 38.5, 38; first phalanx, 12, 12.5; second phalanx, 16, 16 (total length of fourth digit, 65); length of fifth metacarpal, 38, 40; first phalanx, 11, 11; second phalanx, 14, 12, (total length of fifth digit, 62); ear, length, (17); ear, breadth, (11.5); tragus, (7); tibia, (16.5); hind foot, 15, 15, (13.7); depth of interfemoral membrane, 15, 15, (12); calcar, 5, 5, (5); nose leaf, length × breadth, 12.5 × 8.5. — Skull: greatest length, 20.7, —, (19.6); condylobasal length, 18.4, 18.0; condyle to front of canine, 18.0, 17.6; basal length, 7.2, 7.0; palatal length, 15.7, 15.3; zygomatic breadth, 14.3, 15.3, (13.4); breadth of braincase, 10.3, 10.3; height of braincase, 9.2, 9.8; mastoid breadth, 12.7, 12.7; postorbital constriction, 7.5, 7.6, (7.5); width across molars, 8.6, 8.3; width across cingula canines, 6.4, 6.4; upper tooth-row, c-m^2, 6.3, 6.0, (6); lower tooth-row, c-m_2, 6.5, 6.1, (5.5); length of mandible, 12.3, 12.3.

Remarks. — The original description of *Stenoderma microdon* was based

on two males from Suriname, preserved in alcohol (Peters, 1863, p. 84). Dr. G. H. H. Stein of the Berlin Museum informed me that these specimens can not now be found in the collections of his Museum. In the material of Suriname bats at hand no specimens of Peters's species were found.

In his 1863 paper Peters described *Stenoderma microdon* as belonging to a new subgenus, named by him *Pygoderma.* In a later publication, Peters (1865a, p. 357 footnote) gave *Pygoderma* full generic rank, considering at the same time his 1863 species to be identical with *Phyllostoma bilabiatum* Wagner as well as with *Artibeus leucomus* Gray. Subsequent authors followed Peters's 1865 point of view, sometimes with some reserve because so little is known about *Pygoderma microdon.* The measurements of the Brazilian specimens examined by me agree rather well with both those of the type of *P. microdon,* and those given by Vieira (1942, p. 366).

Family DESMODIDAE

To this family belong the genuine blood-sucking vampire bats, which are dangerous for man and domestic animals because they may transmit rabies. These sanguivorous bats are characterized by (1) the absence of a distinct lanceolate nose leaf; the nostrils being surrounded by dermal outgrowths that form a rudimentary nose leaf only (see fig. 29); (2) the absence of an external tail, while the interfemoral membrane is narrow or even reduced to a mere fringe; (3) the very large, canine-like, upper incisors, which almost fill the space between the canines, while the lower incisors are of normal size compared to the canines, and (4) the strongly reduced premolars and molars.

The family Desmodidae includes the three monotypical genera *Desmodus, Diaemus,* and *Diphylla,* of which so far only *Desmodus* has been found with certainty in Suriname. The occurrence of *Diaemus* in this part of the Guianas is practically certain, while that of *Diphylla* is probable. For this reason *Diaemus youngii* (Jentink) as well as *Diphylla ecaudata* Spix are included in the following key. The differences between *Desmodus* and *Diphylla* were extensively discussed by H. Allen (1896).

The family name Desmodidae, though originally proposed in this spelling by I. Geoffroy (1850-1858, cf. Palmer, 1904, p. 737), is at present generally written Desmodontidae. The first author to use this emended spelling seems to have been Gill (Standard Natural History, 1886, vol. 5, p. 175). The generic name *Desmodus* is evidently derived from the Greek words δεσμός (desmos: bundle) and ὀδούς (odous: tooth). In the original description of the genus, Wied (1826, p. 231) does not explicitly give this derivation, but it is clear from the German word "Bündelzahn", which he used for the genus. When latinizing the name to *Desmodus,* Wied changed the ending "-odous"

to "-odus". Article 29(c) of the 1961 Code (page 29) states: "If the name of a type-genus is or ends in a Greek word latinized with a change in termination, the stem is that appropriate for the latinized form". The stem in the present case is thus *Desmod-* and not *Desmodont-*, so that the family name should be written Desmodidae, not Desmodontidae. Had Wied used the spelling *Desmodous* for the genus, then the spelling Desmodontidae for the family name would have been correct. This case is entirely similar to that of *Phyllostomus* (family name Phyllostomidae) and *Phyllostoma* (family name Phyllostomatidae).

Key to the South American Desmodidae

1. Interfemoral membrane rudimental, confined to a mere fringe on the inside of the thigh and leg, and not developed in the centre; provided with rather long hairs. Length of forearm about 55 mm. Dental formula: $\frac{2.1.1.2}{2.1.2.2}$; outer upper incisors minute, structureless, placed close to the middle of the inner side of the canines; inner lower incisors with four lobes, outer incisors with seven lobes . . . . . *Diphylla ecaudata ecaudata* Spix

— Interfemoral membrane moderately developed, when stretched its middle part reaches distinctly behind the knees. Length of forearm varying from 50 to 63 mm . . 2

2. Wing membranes with distinct white markings between the third and fifth digits, extending from the second phalanges to the free margin; length of the thumb distinctly shorter than that of the hind foot. Length of forearm about 53 mm. Lower outer incisors bilobed, the inner entire (see fig. 30a). Dental formula: $\frac{1.1.1.1}{2.1.2.1}$ or $\frac{1.1.1.2}{2.1.2.1}$ . . . . . *Diaemus youngii youngii*, p. 197

— Wing membranes without white markings, uniformly dark brown in colour; the thumb about as long as the hind foot. Length of forearm usually more than 55 mm. Both lower incisors bilobed (fig. 30b). Dental formula: $\frac{1.1.1.1}{2.1.2.1}$ . . . . . *Desmodus rotundus rotundus*, p. 188

Desmodus rotundus rotundus (E. Geoffroy)

(figs. 1g, 29b, 30b; pl. XXI)

"Bats" (p.p.), Warren, 1667, Description of Surinam, pp. 21-22.

"Vleder-muysen" (p.p.), Warren, 1669, Beschrijvinge van Surinam, p. 17.

"Vledermuizen" (p.p.), Van Berkel, 1695, Amerikaansche Voyagien, p. 129.

"Vledermuizen" (p.p.), Herlein, 1718, Volk-Plantinge Zuriname, p. 178.

"Vledermuizen" (p.p.), Pistorius, 1763, Beschryvinge van de Colonie Zuriname, p. 73.

Vespertilio Cynocephalus, Maximus, Auritus, facie Canina (p.p.), Fermin, 1765, Hist. nat. Hollande equinoxiale, p. 8.

"Surinamische Fledermäuse", Anonymus, 1768, Berlinische Sammlungen, vol. 1, pp. 53-57.

"Grandes Chauve-Souris" (p.p.), Fermin, 1769, Description de la Colonie de Surinam, vol. 2, p. 140.

"Bats of Guiana" (p.p.), Bancroft, 1769, Natural History of Guiana, pp. 146-147.

"Groote Vleder-Muisen" (p.p.), Fermin, 1770, Beschryving van de Colonie van Suriname, vol. 2, pp. 120-121.

"Groote Vledermuizen, genaamd vliegende Honden of Katten" (p.p.), Hartsinck, 1770, Beschryving van Guiana, vol. 1, p. 98.

"Vledermuizen van Guiana" (p.p.), Bancroft, 1782, Natuurlyke Geschiedenis van Guiana, pp. 115-116.

"Vampire or spectre of Guiana" (p.p.), Stedman, 1796, Narrative Revolted Negroes of Surinam, vol. 2, pp. 142-143; 170; 205.

Phyllostoma rotundum E. Geoffroy, 1810, Annales Mus. Hist. Nat., Paris, vol. 15, pp. 181 and 186.

"Vampire" (p.p.), Von Sack, 1810, Narrative of a voyage to Surinam, p. 153 footnote.

"Vampyrs" (p.p.), Von Sack, 1821, Reize naar Suriname, vol. 1, p. 207 footnote.

"Vampyrs" (p.p.), Teenstra, 1835, Landbouw in Suriname, vol. 2, pp. 416-417.

"Vampire" (p.p.), Benoit, 1839, Voyage à Surinam, p. 54.

"Fledermäuse" (p.p.), Lammens, 1844, Isis 1844, p. 108.

"Vampyrs", Kappler, 1854, Zes jaren in Suriname, vol. 1, pp. 123-124; vol. 2, pp. 67, and 86-87.

"Eene vledermuis", Copijn, 1858, West-Indië, vol. 2, p. 13.

"Blutsaugende Fledermäuse", Kappler, 1881, Holländisch-Guiana, pp. 158-160.

Desmodus rufus, Kappler, 1881, Holländisch-Guiana, p. 163.

"Fledermäuse" (p.p.), Kappler, 1887, Surinam, pp. 58-60.

"Vleermuizen", Junker, 1933, West-Indische Gids, vol. 16, p. 187.

"Vampieren-soort", Langeler, 1955, Surinaamse Landbouw, vol. 3, pp. 184-193.

"Vampieren", Anonymus, 1955, Landbouw Nieuws (April, 1955), pp. 1-2.

"Vampier-vleermuizen", Collier & Tiggelman-Van Krugten, 1955, Vox Guyanae, vol. 1, pp. 149-159.

Type locality. — "Le Paraguay". Restricted by Cabrera (1958, p. 93) to Asuncion, the capital of Paraguay. The original description of *Phyllostoma rotundum* E. Geoffroy is based on D'Azara's (1801, vol. 2, pp. 273-276) "Chauve-souris troisième, ou Chauve-souris brune" from Paraguay.

Distribution. — The present species has a wide distribution, which extends from South America north of 33° lat. northward into Mexico. It is generally accepted by authors (though, as far as known to me, no relevant arguments are given) that the typical subspecies occurs in South America including the island of Trinidad, while *Desmodus rotundus murinus* Wagner inhabits Central America and Mexico.

Specimens examined.

Paramaribo; March 30, 1939, H. W. C. Cossee; RMNH, reg. no. 3952: female, dried skin and skull; reg. nos. 3949 and 3950: females, preserved in alcohol, skulls extracted; reg. no. 3951: male, preserved in alcohol, skull extracted.

Suriname; 1857, A Kappler; SMN, Nr. 3538, 1 and 2: females, preserved in alcohol, skulls extracted.

Description. — D'Azara (1801, vol. 2, pp. 273-276); E. Geoffroy (1810, pp. 181 and 186); Huxley (1865); Dobson (1878, pp. 546-550: *Desmodus rufus* Wied; pl. xxx figs. 7: head, front view; 7a: head, left side view; 7b: upper incisors and canines, front view); H. Allen (1896); Miller (1907a, pp. 177-178; pls. ix fig. 3 and x fig. 3: right upper and lower tooth-rows, respectively); Vieira (1942, pp. 373-377; fig. 30: animal, ventral view);

Felten (1956a, pp. 354-364: *D. rotundus murinus*; fig. 3: head, front view; pl. 48 fig. 7: skull); Goodwin & Greenhall (1961, pp. 267-270; fig. 78: head, front view; fig. 79: thumb; fig. 80: upper tooth-row, left side view; pl. 28 figs. 1-3: skull).

Length of forearm in males varying from 52.4 to 60.2 mm, in females from 56.7 to 63 mm; nostrils surrounded by dermal outgrowths forming a rudimentary nose leaf without a distinct lanceolate lancet; ears, rather short and broad, about 17 mm long and 12 mm broad, rounded above; tragus short and broad; thumb conspicuously long and strong, slightly longer than

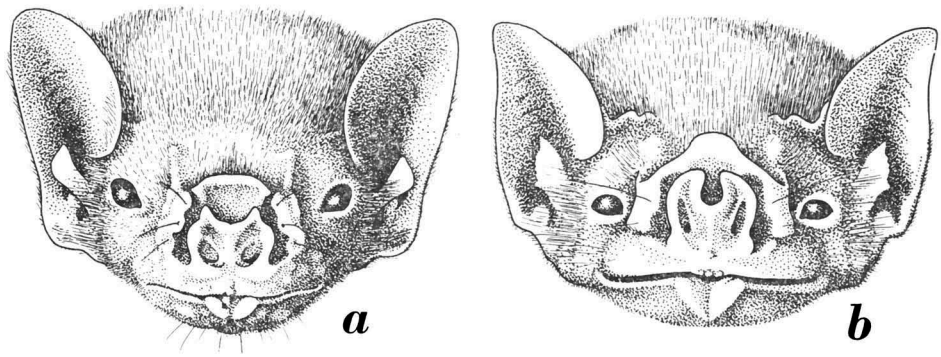

Fig. 29. a, *Diaemus youngii youngii* (Jentink), RMNH, reg. no. 12088, holotype; b, *Desmodus rotundus rotundus* (E. Geoffroy), RMNH, reg. no. 3949.

the hind foot, its metacarpal with a short, rounded cushion at the base, a more elongated pad extends to its middle; no external tail; interfemoral membrane narrow, its median part extending to about the level of the middle of the tibia, about 10 mm wide, continuing as a very narrow strip along the tibia; calcar rudimentary, presenting itself as a wart-like excrescence; wing membrane from the distal fourth of the tibia. Fur rather short above and beneath, extending on the upper arm; a short covering of hairs is found on the dorsal surface of the antebrachial membrane, on the wing membrane between the body and a line connecting the elbow and the foot, and on the interfemoral membrane. As to the colour of the fur, two sharply defined phases may occur in both males and females. According to J. A. Allen (1900, p. 87): " In the rufous phase the color above is dark rufous brown, the hairs basally light yellow; below pale yellowish brown, the hairs uniform from base to tip, the tips slightly silvery. In the gray phase the color above is blackish brown, the basal half of the hairs grayish white; below lustrous silvery gray at the surface, the hairs darker (pale brown) basally".

Dental formula: $\frac{1.1.1.1}{2.1.2.1}$. Upper incisors very large, triangular with sharp cutting-edges, flat, strongly projected forward, completely filling the space between the somewhat smaller flat, scoop-like incisors; upper premolar and molar reduced, their combined alveolar length shorter than that of the canine. Lower incisors in pairs, distinctly bilobed; the teeth of each pair separated from one another and from the canines by spaces which are about 1.5 times the combined alveolar length of the inner and outer incisor; canines of normal size compared with the incisors; cheek-teeth reduced. See further under *Diaemus youngii*.

The external and skull measurements of the six examined specimens from Suriname are given in Table XXII.

TABLE XXII

External and skull measurements of one male and five females of *Desmodus rotundus rotundus* (E. Geoffroy) from Suriname.

Museum		RMNH	SMN	SMN	RMNH	RMNH	RMNH
Reg. number		3951	3538,1	3538,2	3950	3949	3952
Sex		♂	♀	♀	♀	♀	♀
Forearm		57.0	61.0	60.5	61.5	60.5	63
Thumb		17	19	18	18	17	18
Third digit,	metacarpal	47	55	55	55	55	54
	1st phalanx	10	11	11	11	11	11
	2nd phalanx	16	18	18	18	19	20
	3rd phalanx	14	15	15	16	16.5	15
Fourth digit,	metacarpal	45	55	55	54	54.5	54
	1st phalanx	9.5	10	9.5	10	10.5	10
	2nd phalanx	14.5	17	16.5	16.5	17.5	17
Fifth digit,	metacarpal	46	54	54	54	54	53
	1st phalanx	10	11	9.5	11	10.5	11
	2nd phalanx	15	14	15	15	15.5	16
Tibia		24	28	28	27	26	29
Hind foot		15	18	17	17.5	16.5	16
Calcar		1	1	1	1	1	1
Skull:							
greatest length		22.8	23.8	24.4	23.8	23.7	24.0
condylobasal length		20.6	21.8	21.4	21.4	21.0	22.0
condyle to front of canine		19.2	19.6	19.5	19.3	19.0	19.7
basal length		17.5	18.9	19.0	18.5	18.1	19.1
palatal length		8.4	9.7	9.6	9.1	8.6	9.3
zygomatic breadth		11.8	11.9	12.6	12.2	12.0	12.1
breadth of braincase		12.3	12.2	12.4	12.2	12.0	12.5
height of braincase		11.6	11.4	11.5	11.9	11.8	12.3
mastoid breadth		12.3	12.6	12.8	12.8	12.1	12.7
postorbital constriction		5.0	5.1	5.5	5.5	5.2	5.2
width across molars		5.8	5.9	6.3	6.0	6.2	6.2
width across canines		5.4	5.9	6.2	5.8	5.8	6.1
upper tooth-row, c - m^1		3.5	3.4	3.3	3.4	3.3	3.4
lower tooth-row, c - m_1		4.4	4.5	4.4	4.6	4.4	4.2
length of mandible		14.2	14.5	14.6	14.5	14.2	14.7

Remarks. — The measurements of the Suriname *Desmodus* agree very well with those given by Hershkovitz (1949, pp. 449-450) and Goodwin & Greenhall (1961, p. 267) for Colombian and Trinidad specimens of the typical form of *D. rotundus*. It is evident from the published figures that the males of *Desmodus* are smaller than the females of comparable age.

Osgood (1912, p. 63 footnote) distinguished two forms of *D. rotundus*: a northern, occurring in Central America and Mexico, and a southern, inhabiting S. America. In the northern form the maximum length of the forearm is 55 mm, in the southern this length varies from 60 to 64 mm. As is demonstrated by the figures of material of *D. rotundus* from El Salvador published by Felten (1956a, p. 356), it is impossible to separate the two forms on basis of the length of the forearm alone. Felten found, namely, that in his material of 33 males this length varies from 54 to 60 mm (mean value 56.8 mm) and in his 23 females from 57 to 63 mm (mean value 59.9 mm). It remains to be seen whether there are other characters that can be used to separate the two forms.

Occurrence in Suriname. — Its habits of sucking blood from animals and man have made *Desmodus* a well known bat in Suriname. Even in the oldest narratives mention was made of the vampire bat. But as the animal does its work usually unnoticed, sucking blood when its victim is fast asleep, it has taken a very long time before the identity of the vampire bat was definitely ascertained. The old authors, probably basing themselves on information obtained from unreliable sources, thought the vampire bats to be the largest, and what they thought to be the most ferocious looking, Suriname species, *Vampyrum spectrum* (Linnaeus). As pointed out on page 124 this supposition has persisted to at least the middle of the previous century, when it at last became generally known that the true sanguivorous vampire is the small *Desmodus,* and not the large but rather harmless *Vampyrum.* This erroneous belief is also the cause that the generic name *Vampyrum* went to the large bats without vampire habits. The only ancient (pre-1800) author who pointed out that the vampire of Suriname is a small species, is, so far as I know, Anonymus (1769).

Warren (1669, pp. 21-22), the first author to publish on Suriname vampires, described their actions as follows: "The *Bats* are found to be not a little noxious both to Men and Beasts, in the night drawing away their Blood, and so easily, that the loss is not perceivable, 'till it be past prevention, which (if I was not misinform'd) has forc'd several people to foresake their Dwellings, to save that little blood they had, which would have been otherwise suck'd out."; and on page 9 Warren remarked: "*Hogs* would increase infinitely, did not the *Bats* Retard it, by Biting off their Teats" (in the

Dutch 1669 version these citations are found on pp. 17 and 9, respectively). This account was practically literally copied by Van Berkel (1695, p. 86), Herlein (1718, p. 178), and Pistorius (1763, p. 73), none of whom added any new information. Fermin (1765, p. 8; 1769, vol. 2, p. 140; 1770, vol. 2, p. 121) in his various books mentioned the presence in Suriname of bats that suck blood from man, horses, and other animals.

Anonymus (1768, pp. 55-57) described the action of Suriname *Desmodus* as follows: "Diese Thiere setzen sich ohne Unterschied an allen Theilen des Körpers an, am liebsten aber an der Seite des Nagels der grossen Zehe,

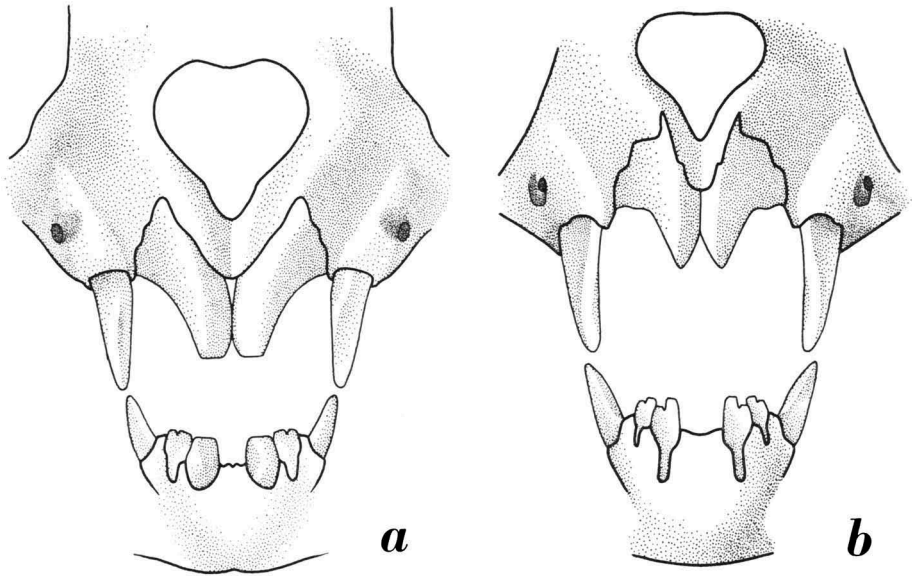

Fig. 30. Canines and incisors in front view a, *Diaemus youngii youngii* (Jentink), RMNH, reg. no. 12088, holotype; b, *Desmodus rotundus rotundus* (E. Geoffroy), RMNH, reg. no. 3949. Width across cingula canines in mm: a, 5.7; b, 5.8.

an den Knochen des Schienbeins und an allen Theilen, wo die Haut am vestesten über das Fleisch gespannt ist. Bey ihren Bissen streifen sie blos die Haut in der Rundung von höchstens ¾ Linien des Durchmessers, und dieses so glatt, als ob man die Haut bedachtsam mit einem Scheermesser abgeschnitten hätte. Dieser Biss ist nicht viel empfindlicher als ein Flohstich, weil man nicht davon erwachet; wie man sich aber zuweilen bey einem Flohstich im Schlaf beweget, so regt man sich auch leicht bey dem Biss einer solchen Fledermaus. Sie erschrickt darüber, und begiebt sich zurück, ohne einen weitern Versuch zu machen, als die blosse Wunde, welche, wie ich

schon gesagt, weiter nichts ist, als ein klein zerkratztes Fleckgen, worauf sich sogleich ein Tropfen Blut setzt, der kaum gross genug ist, um zerfliessen zu können. Schläft man aber so vest, dass man den Biss nicht empfindet; so sauget die Fledermaus ganz sanft so viel Blut aus, als sie zur Sättigung ihres Appetits nöthig hat: Dies kann eben nicht viel seyn, weil diese Fledermäuse nicht grösser sind, als die europäischen. Mehr können sie nicht aussaugen oder fortbringen, als ihr Körper fassen kann, welches allerdings sehr wenig ist. Allein das ist sonderbar, dass nach ihrem Abzug das Blut immer fort, und so häufig fliesst, dass es nicht allein die dicke Hangematte, worinn man schläft, völlig durchdringet, sondern auch auf der Erde ein Fleck von der Grösse eines Tellers bezeichnet. Man kann daraus abnehmen, dass sie wenigstens 2 bis 3 Becken voll Blut herbeyziehen, und auslaufen lassen. Dem ohngeachtet ist der Biss nicht giftig, und heilt so leicht, als das kleinste aufgekratzte Fleckchen, ohne Entzündung, ohne Jucken oder Schmerz. Es kostet Mühe, die Wunde zu erkennen, so klein und zart ist dieselbe. Nach einem solchen Biss ist man gemeiniglich viel leichter und aufgeräumter. Wenn er nicht öfter als ein oder zwey mal die Woche wiederholt wird, befindet man sich allezeit besser darnach, als vorher. Wird man aber zu oft gebissen, wie es einigen widerfahren, deren süsses Blut diese Thiere alle Nächte herbeylockte; so ist es nicht möglich, die Entkräftung zu vermeiden. Man fällt zuletzt in Ohnmacht, und stirbt an der Verblutung, wie dieses mit einigen unserer Leute geschehen ist. Ich selbst bin in einer Nacht zwey mal gebissen worden; als ich des Morgens aufstehen wollte, konnte ich nicht auf den Beinen stehen, ob ich gleich damals jung und stark war". Anonymus also stated that apart from attacking man, cattle, and horses the bats also, but less frequently, suck blood from poultry.

Bancroft (1769, p. 147) stated that the species is "very expert at bleeding. Most of the inhabitants, whether *Europeans* or Natives, in this country, sleep in hammocks, as being more secure from snakes and poisonous insects than beds, and their feet are thereby exposed to these animals, who with great dexterity imperceptibly open the veins, and suck the blood, until they are satisfied; and it is not unfrequent for persons to wake, and find themselves faint and wet with their own blood. They likewise suck the blood of Horses, Mules, Oxen, &c. in the same manner". Hartsinck (1770, p. 98), Von Sack (1810, p. 153 footnote; 1821, p. 207 footnote), Benoit (1839, p. 54) mentioned the vampires without adding anything new.

Stedman's (1796, vol. 2, pp. 142-143) vivid account of the results of the actions of the vampire bat is too interesting not to be cited in full here: "I cannot here forbear relating a singular circumstance respecting myself, viz., that on waking about four o'clock this morning in my hammock, I was

extremely alarmed at finding myself weltering in congealed blood, and without feeling any pain whatever. Having started up, and run for the surgeon, with a fire-brand in one hand, and all over besmeared with gore; to which if added my pale face, short hair, and tattered apparel, he might well ask he question,

"Be thou a spirit of health or goblin damn'd,

"Bring with thee airs of Heav'n or blasts from Hell!"

The mystery however was, that I had been bitten by the *vampire* or *spectre* of Guiana, which is also called the *flying-dog* of New Spain, and by the Spaniards *perrovolador*; this is no other than a bat of a monstrous size, that sucks the blood from men and cattle when they are fast asleep, even sometimes till they die; and as the manner in which they proceed is truly wonderful, I shall endeavour to give a distinct account of it. — Knowing by instinct that the person they intend to attack is in a sound slumber, they generally alight near the feet, where while the creature continues fanning with his enormous wing, which keeps one cool, he bites a piece out of the tip of the great toe, so very small indeed that the head of a pin could scarcely be received into the wound, which is consequently not painful; yet through this orifice he continues to suck the blood, until he is obliged to disgorge. He then begins again, and thus continues sucking and disgorging till he is scarcely able to fly, and the sufferer has often been known to sleep from time into eternity. Cattle they generally bite in the ear, but always in such places where the blood flows spontaneously, perhaps in an artery — but this is entering rather on the province of the medical faculty. Having applied tobacco-ashes as the best remedy, and washed the gore from myself and from my hammock, I observed several small heaps of congealed blood all round the place where I had lain, upon the ground: upon examining which, the surgeon judged that I had lost at least twelve or fourteen ounces during the night". Further Stedman dealt with *Desmodus* on pages 170 and 205, noting there that he once "saw a white man who had lately lost both his eyes in one night by the bats or vampires, as they are called".

In his account of the agriculture of Suriname, Teenstra (1835, vol. 2, pp. 416-417) remarks: "Er bestaan voorbeelden, dat zij de menschen, in slaap zijnde, op eene onmerkbare wijze bloed afzogen, en wel uit de teenen, dat men niet voor en aleer zij loslaten, maar dan ook smartelijk gevoelen zoude. Ik heb een' ouden koewachter gezien, die in den slaap door de vleermuizen ongeneesbaar aan zijne wang verwond geworden was; maar dat er menschen aan gestorven zijn, komt mij overdreven voor. ... Paarden en runderen kunnen verschrikkelijk van de vleermuizen geplaagd en mager gehouden worden; evenwel hebben de varkens nog meer van haar te lijden, aangezien zij dezen

de tepels afbijten". (Examples are known that bats suck the blood of sleeping human beings from the toes, in such a way that their victims do not perceive any pain before the bats have finished. I have met an old cowboy who during his sleep was incurably wounded in his cheek by bats; but the stories that people died from the attacks of these animals in my opinion are exaggerated. ... Horses and cattle may be tormented terribly by the bats and then become very thin, but the pigs suffer still more as the bats bite off their teats).

At the end of his survey on the Suriname leaf-nosed bats, Lammens (1844, p. 108) noted: "Die ganze Welt sagt, diese Fledermäuse sögen Menschen und Tieren das Blut aus. Das ist wirklich wahr: ich selbst habe einen Menschen gesehen, der von einer ausgesogen wurde. Dass man sie nicht spürt, ist nicht zu verwunderen: denn die Neger und viele Creolen haben einen fast lethargischen Schlaf, in welchem man sie forttragen kann, ohne dass sie es bemerken. Sie wachen sicherlich nicht auf durch diesen Einschnitt (den ich über 1″ lang gesehen habe). Indessen weiss man nicht, ob alle Fledermäuse saugen, oder nur gewisse Gattungen. Die Schriftsteller scheinen es von denjenigen zu glauben, welche einen Kamm auf der Nase haben".

Copijn (1858, p. 13) gives an account of a bat which attacked a sleeping girl and started to bleed her at the toes. Also Kappler (1854, vol. 1, pp. 123-124; vol. 2, pp. 86-87; 1881, pp. 158-160; 1885, p. 559; 1887, pp. 58-60) gave interesting accounts on the Suriname vampire bats and on his efforts to save himself and the negroes from being bitten. In his 1885 paper (p. 60) Kappler remarked that on request of the late Queen Sophie of the Netherlands he tried to catch a vampire bat of which he had established the blood-sucking habit; unfortunately Kappler was not successful in witnessing a *Desmodus* in action. The German naturalist therefore was in this respect as unlucky as his English colleague Waterton (1838, p. 71) who noted: "Although I was so long in Dutch Guiana, and visited the Orinoco and Cayenne, and ranged through part of the interior of Portuguese Guiana, still I could never find out how the vampires actually draw the blood; and, at this day, I am as ignorant of the real process as though I had never been in the vampire's country. I should not feel so mortified at my total failure in attempting the discovery, had I not made such diligent search after the vampire, and examined its haunts. Europeans may consider as fabulous the stories related of the vampire; but, for my own part, I must believe in its powers of sucking blood from living animals, as I have repeatedly seen both men and beasts which had been sucked, and, moreover, I have examined very minutely their bleeding wounds".

After the publication of Kappler's books hardly any mention of *Desmodus* is to be found in the popular literature concerning Suriname. In a few

narratives, like the one by Junker (1933, p. 187), the presence of blood-sucking bats was mentioned, but no new important information was published. Around 1955 the interest in *Desmodus* revived in Suriname, mainly because of the rôle which was ascribed to the animal as the principal carrier and transmitter of paralytical rabies. In October 1953, namely, an epidemic broke out among the cattle in the Paramaribo area (Santozwamp, near Welgedacht; Lelydorp; Kwatta) and in March 1955 about 40 to 50 cows in this region died from a lyssa virus, which was supposed to have been transmitted by bats. This supposition was strengthened by the fact that according to information obtained from the cattle owners the cows had badly suffered from attacks by vampire bats. Accounts of this epidemic were published by Langeler (1955) and by Collier & Tiggelman-Van Krugten (1955). The investigations on this subject are still being continued.

For a first orientation on the natural history of vampire bats the papers of Dalquest (1955), Greenhall (1959a), and Goodwin & Greenhall (1961, pp. 196-198; 267-270) are most useful. Though *Desmodus* seems to be the principal transmitting agency of rabies, insectivorous and fruit-eating bats have also been found to be infected with rabies and their saliva likewise may carry infection. Man and animals bitten by these infected bats may develop rabies. As even non-bloodsucking bats in a rabid condition attack and bite man and animals, they are almost as dangerous in this respect as the true vampires. From Trinidad eight species of bats are known of which it has been proved that they were infected with the rabies-virus; four of these species, viz., *Carollia perspicillata, Artibeus lituratus, Desmodus rotundus,* and *Molossus molossus*, are very abundant in Suriname.

Diaemus youngii youngii (Jentink)

(figs. 28b, 29a, 30a; pl. XXI)

Desmodus Youngii Jentink, 1893, Notes Leyden Mus., vol. 15, pp. 282-283.

Type locality. — In the original description Jentink did not indicate the locality of the type specimen, other than stating in the introduction of his paper that he had received his material from Dr. C. G. Young of Berbice, New Amsterdam, British Guiana. In a small paper, however, Young (1896, p. 46) himself listed the exact localities of the bats sent by him to Jentink. For *Desmodus youngii,* Young gave as locality: Upper Canje Creek, Berbice, British Guiana, and therefore this locality is the type locality of the species in question. Apparently inspired by the title of Jentink's paper: "On a collection of bats from the West-Indies", Trouessart (1898, p. 165; 1904, p. 120) regarded the "Antillas" as the region from which Jentink's type origi-

nated. For unknown reasons Vieira (1942, p. 379; 1955, p. 367) gave the type locality as Suriname, but as far as known to me no material has been collected in this region.

Distribution. — The typical form was reported from Brazil (Matto Grosso; São Paulo; Parana), British Guiana, Venezuela, Trinidad, W.I., and Colombia (see Sanborn, 1949b, pp. 282-283; De la Torre, 1956; Goodwin & Greenhall, 1961, pp. 270-272). It is most probable that the Peruvian form *Diaemus youngii cypselinus* described by Thomas (1928c, pp. 288-289) is not subspecifically different from the typical form. Miller (1907a, p. 178) noted that the species occurs in Brazil and in "Dutch Guiana", but the latter indication may be a misprint for British Guiana.

Specimen examined.

Upper Canje Creek, Berbice, British Guiana; before 1893, C. G. Young; RMNH, reg. no. 12088: holotype, adult male, preserved in alcohol. skull extracted.

Description. — Jentink (1893, pp. 282-283); Miller (1906a, p. 84; 1907a, pp. 178-179); Osgood (1912, p. 63); Goodwin & Greenhall (1961, pp. 270-272; fig. 81: head, front view; fig. 82: thumb; pl. 28 figs. 4-6: skull; pl. 46 fig. 2: head, front view). Jentink did not extract the skull of the holotype, he noted only: "The dentition seems not to differ from that of *rufus*". Thomas (1900a, pp. 547-548) dealt more extensively with the skull, while Miller (1906a) created the new genus *Diaemus* for Jentink's vampire bat.

The length of the forearm of *Diaemus youngii* (the Peruvian form included) varies from 50 to 55.2 mm. The notch in the centre of the upper margin of the horseshoe of the rudimentary nose leaf forms a wide angle of about 120 degrees. The ears are short and broad, about 15 mm long and 11 mm broad, rounded above, the outer margin quite straight; the tragus is short, about one-third the ear length, and rather broad. The ear is connected with the upper part of the head by a well-developed skin fold. The thumb is much shorter than the hind foot. The interfemoral membrane is moderately developed, extending in the middle to about two-thirds of the tibia. The calcar is reduced to a minute wart-like excrescense. No external tail. The wing membranes are attached near the base of the outer toe. The upper parts of the body are dark cinnamon brown, the colour becoming lighter on the shoulders and on the sides of the head; the ventral surface is somewhat lighter than the dorsal. The wing membranes are dark brown, except for the following white markings: the antebrachial has a narrow white rim; the greater part of the membrane between the second and third digits is white; the wing between the third and the fourth fingers is white from about half the length of the second phalanx down to the free margin of the

membrane; a white patch is present on the membrane between the fourth and the fifth digits, the base of this patch lies on the free margin.

Dental formula: $\frac{1.1.1.2}{2.1.2.1}$. De la Torre (1956) discussed the dental formula of *Diaemus* and pointed to the presence of a minute second upper molar, which is often absent, at least in adult specimens; for this reason all authors before De la Torre, who overlooked this minute upper molar, gave as dental formula: $\frac{1.1.1.1}{2.1.2.1}$. In the type no trace of these second upper molars can be found. A remarkable difference between the skull of *Desmodus rotundus* and *Diaemus youngii* is provided by the mandible. In *Diaemus* the coronoid process is much higher than the condylus, so that the margin connecting these two points runs obliquely down; in *Desmodus,* however, the coronoid process and the condylus lie at about the same level, so that the margin between the two points runs nearly horizontally. Also the lower incisors show distinct differences in the two species. In *Desmodus* the inner lower incisors are separated by a space of about 1.5 times the combined alveolar length of each pair of incisors, they are of about equal size and both are distinctly bilobed. In *Diaemus* the space between the inner lower incisors is smaller than the alveolar length of one single incisor. The inner lower incisors in *Diaemus* are smaller than the outer; in the type the cutting edge is entire; the outer lower incisor is, however, distinctly bilobed, and separated from the canine by a space which is somewhat greater than the alveolar length of that incisor. The auditory bullae in *Diaemus* are larger and more swollen than in *Desmodus* (see pl. XXI).

The following measurements are of the type of *Diaemus youngii,* the skull measurements have not been published before; the external measurements differ slightly from those given by Jentink. Forearm, 50.0; length of third metacarpal, 50; first phalanx, 10; second phalanx, 25.5; third phalanx, 19.5; length of fourth metacarpal, 49; first phalanx, 9.5; second phalanx, 21; length of fifth metacarpal, 48; first phalanx, 9; second phalanx, 12; ear, length, 15; ear, breadth, 11; thumb, 11; tibia, 21.5; hind foot, 14. — Skull: greatest length, 24.1; condylobasal length, 21.1; condyle to front of canine, 19.1; basal length, 18.4; palatal length, 7.9; zygomatic breadth, 13.3; breadth of braincase, 13.0; height of braincase, 11.8; postorbital constriction, 6.0; width across molars, 6.0; width across canines, 5.7; upper tooth-row, c-m^1, 3.0; lower tooth-row, c-m_1, 3.9; length of mandible, 14.5.

Remarks. — The present species is not represented in the collections of Suriname bats examined by me. Since *Diaemus youngii* has been reported from Suriname, be it probably erroneously, the species is dealt with in the

present paper; this seems the more justified since the holotype is preserved in the Leiden Museum so that information can be given of the skull, of which so far no description had been published.

Family FURIPTERIDAE

The family Furipteridae contains two monotypical genera, viz., *Amorphochilus* and *Furipterus,* of which only the latter occurs in Suriname. The genus *Furipterus* is externally characterized by (1) the short, peculiar tragus, which is triangular, (2) the greatly reduced thumb, which is included in the wing membrane, being placed at the base of the minute, apparently functionless claw, (3) the presence in the third digit of two phalanges of which the first is very small compared with the long, flexible second, and (4) the large interfemoral membrane, which is as long as head and body combined, while the tail terminates indistinctly at about three-fourths of that membrane.

Furipterus horrens (F. Cuvier)

(figs. 1d, 27c, 31; pl. XXII)

Furia horrens F. Cuvier, 1828, Mém. Mus. Hist. Nat. Paris, vol. 16, pp. 149-155; pl. 9 (name on p. 155).
Furia horrens, Peters, 1865, Monatsber. Akad. Wiss. Berlin 1865, pp. 645-648.
Furia horrens, Dobson, 1878, Catalogue Chiroptera British Museum, p. 357.
Furiens horreus, Kappler, 1881, Holländisch-Guiana, p. 163.
Furipterus horrens, Sanborn, 1941, Field Mus. Nat. Hist., Zool. Ser., vol. 27, p. 381.

Type locality. — In the original description, Cuvier (1828, p. 155) remarked that the type specimen was obtained from Mr. L. Th. Leschenault de la Tour "qui la découvrit à la Mana dans son premier voyage en Amérique"; by "la Mana" is meant the Mana River, French Guiana.

Distribution. — The species has a wide distribution from southern Brazil north through the Guianas to Trinidad, W.I., and Colombia. Though Peters, Dobson, and Kappler reported the species from Suriname, the first exact locality in Suriname has been given by Sanborn (1941, p. 381), who examined a male specimen from Camp One, Coppename River, above Kaaimanston, collected there on July 8, 1938.

Specimens examined.

Suriname; date unknown, A. Kappler; SMN, Nr. 684: adult male, preserved in alcohol, skull extracted.

New Amsterdam, British Guiana; date unknown, C. G. Young; RMNH, reg. no. 13488: adult male, preserved in alcohol, skull extracted.

Description. — The extensive original description by F. Cuvier (1828) is accompanied by excellent figures (pl. 9 fig. 1: animal, ventral view; fig. 2:

head, left side view; figs. 3-11: skull and teeth). Tomes (1856, pp. 172-176; pl. xlii: animal, ventral view, coloured fig.; head, front view; ear with tragus; skull) dealt extensively with the genus *Furipterus,* describing a specimen from St. Catharina, Brazil, as a new species (*F. caerulescens*), which, however, is apparently identical with *F. horrens*; Gervais (1856, pp. 69-71; pl. 11 fig. 2: animal, dorsal view (coloured); pl. 14 figs. 6, 6a-6c: skull and teeth); Peters (1865d, pp. 645-648); Dobson (1878, pp. 356-357); Miller (1907b, pp. 188-189; fig. 29: skull); Goodwin & Greenhall (1961, pp. 273-274; fig. 86: head, front view; fig. 87: thumb; pl. 30 figs. 1-3: skull).

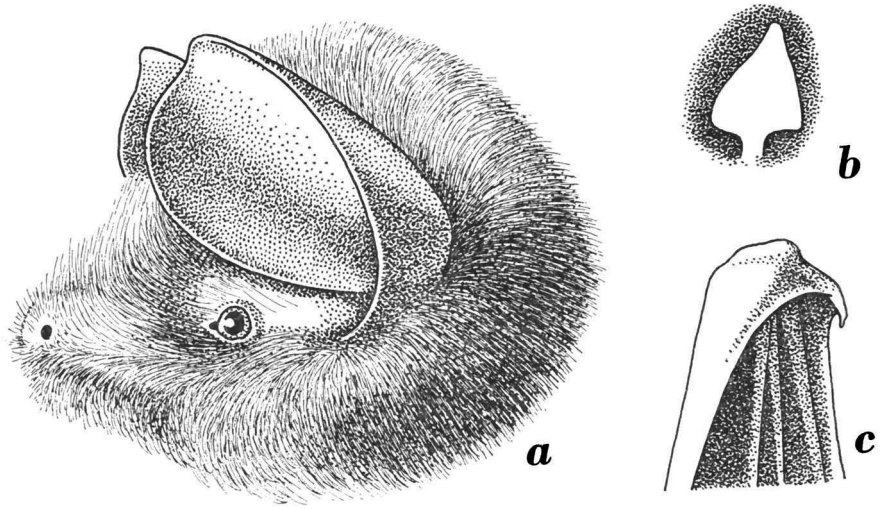

Fig. 31. *Furipterus horrens* (F. Cuvier), SMN, Nr. 684. a, head; b, tragus; c, thumb.

Length of forearm varying from 31.2 to 35.7 mm; ears as broad as high, roundish, funnel-shaped; tragus short and broad, triangular; thumb greatly reduced, included in the wing membrane, the minute, apparently functionless claw being free; interfemoral membrane large, as long as the head and body, when stretched reaching far beyond the feet; tail wholly enclosed in the interfemoral membrane, ending indistinctly in its posterior part, not perforating the membrane or appearing on its dorsal surface; calcar about as long as the tibia and as the entire free posterior margin of the interfemoral membrane; wing membranes from the tarsus, about in the middle between the outer toes and the ankles. Fur soft; dorsal surface bluish gray, slightly tipped with dusky-brown; chin more reddish brownish; ventral surface somewhat paler than the dorsal surface, with more whitish-grey; ventral

surface of the interfemoral membrane covered with fine thin hairs ranged along the transverse dark lines; colour of the membranes dark brown.

Dental formula: $\frac{2.1.2.3}{3.1.3.3}$. Rostrum rather short, about half the length of the braincase, sharply set off from the high braincase; upper incisors in pairs, the outer slightly smaller than the inner; both the space between the two inner incisors and that between the outer incisor and the canine are distinct, upper canine small, its shaft about equal in height to the large second premolar; first upper premolar about half the size of both the canine and the second premolar. Lower incisors with trifid cutting edges, they form a continuous row between the canines; lower canine as high as both the second and the third premolars, which are of about equal size; first lower premolar about half the height of the canine.

External and skull measurements of the examined specimens from Suriname and British Guiana, respectively. Forearm, 35.3, 35.5; length of third metacarpal, 31.5, 31.5; first phalanx, 5, 5.5; second phalanx, 18, 20; length of fourth metacarpal, 28.5, 29.5; first phalanx, 6.5, 6.5; second phalanx, 7.5, 9; length of fifth metacarpal, 28.0, 28.5; first phalanx, 10.5, 11; second phalanx, 5, 6; tibia, 14, 14; hind foot, 7, 7; calcar, 15, 17; depth of interfemoral membrane, approximately, —, 35. — Skull: greatest length, 11.8, 11.9; condylobasal length, 10.9, 11.3; condyle to front of canine, 10.4, 10.7; basal length, from front of i^1, 10.1, 10.2; palatal length, from front of i^1, 5.4, 5.4; zygomatic breadth, 7.7, 7.9; breadth of braincase, 5.9, 6.2; height of braincase, 5.4, 5.5; mastoid breadth, 6.4, 6.4; interorbital constriction, 3.1, 3.0; width across cingula canines, 2.8, 2.9; width across molars, 4.8, 5.1; upper tooth-row, c-m^3, 4.7, 4.9; lower tooth-row, c-m_3, 5.0, 5.2; length of mandible, 8.3, 8.6.

Remarks. — The examined British Guiana specimen of *Furipterus horrens* was erroneously dealt with by Jentink (1893, pp. 279-280) under the name *Natalus stramineus* Gray. Basing themselves on Jentink's incorrect identification, subsequent authors, e.g., Young (1896, p. 44), Beebe (1919, p. 219), Cabrera (1958, p. 95), reported that species from British Guiana. In this connexion it is worth while to note that Goodwin (1959, pp. 2-7) in his revision of the genus *Natalus* does not report the species from this region.

The examined Suriname specimen of the present species was extensively described by Peters (1865d, pp. 645-648). Jentink (1893, p. 280) as well as Peters (1865d, pp. 647-648) included in their descriptions external measurements, which, however, in several cases differ slightly from those given by me. These differences are partly accounted for by that Jentink and Peters

took their measurements in a different way, and partly by that the material in the course of time may have somewhat changed. So it is very difficult at present to take the length and the breadth of the ears; Peters noted for the Suriname specimen: "Höhe des Ohrs, 10; Höhe des vordern Ohrrandes, 7.5; Breite des Ohrs, 7.5".

Family THYROPTERIDAE

The most striking character of this neotropical family of bats is the presence of a conspicuous circular sucking disk at the base of the thumbs and on the soles of the feet (fig. 32b, c). The funnel-shaped ears are separated; the third digit has three phalanges; the wing membranes are attached to the base of the outer claws; the interfemoral membrane is broad, enclosing the slender tail, the tip of which projects beyond the posterior border of the membrane, the length of this free end varies from 7 to 35 per cent of the total length of the tail.

The family Thyropteridae contains the single genus *Thyroptera* with two valid species: *Th. discifera* (Lichtenstein & Peters) and *Th. tricolor* Spix. The two species can externally be distinguished by the following characters: (1) in *Th. discifera* the dark brown ventral surface is only slightly paler than the dorsal surface, while in *Th. tricolor* the greater part of the ventral surface is whitish, contrasting strongly with the dark or reddish brown colour of the upper parts; (2) in *Th. discifera* the calcar bears only one cartilaginous projection which extends into the posterolateral border of the interfemoral membrane, while in *Th. tricolor* two such projections are present.

At present only *Thyroptera tricolor* is known to occur in Suriname. However, since Thomas (1928b, p. 257) reported *Th. discifera* from Cayenne, French Guiana, that species may also be expected in Suriname. Cabrera (1958, pp. 97-98) and Hall & Kelson (1959, pp. 156-157; map 117) discuss the distribution of the two species and their subspecies.

Thyroptera tricolor tricolor Spix

(figs. 27d, 32; pl. XXII)

Thyroptera tricolor Spix, 1823, Simiarum et Vespertilionum Brasiliensium species novae, p. 61, pl. xxxvi fig. 9.

Thyroptera bicolor Cantraine, 1845, Bull. Acad. Roy. Sciences et Belles-lettres Bruxelles, vol. 12, pt. 1, pp. 492-495; plate.

Thyroptera tricolor, Kappler, 1881, Holländisch-Guiana, p. 163.

Thyroptera tricolor, Jentink, 1887, Mus. Hist. Nat. Pays-Bas, vol. 9, p. 284.

Thyroptera tricolor, Jentink, 1888, Mus. Hist. Nat. Pays-Bas, vol. 12, p. 194.

Type locality. — The type locality of *Thyroptera tricolor* is "ad littora

fluminis Amazonum", Brazil; since Martius and Spix followed the Amazon from Pará up to the Rio Icá the type locality must be the lower Amazon River below Santo Antônio Dolçá at the mouth of the Rio Icá (see Eigenmann, 1917, Mem. Mus. Comp. Zoöl. Harvard, vol. 43, pt. 1, pl. 1). The type locality of *Thyroptera bicolor* is "Surinam".

Distribution. — The present species has a wide distribution from southern Brazil northward through the Guianas, Trinidad, Venezuela, Ecuador, and Colombia into Central America as far as Honduras. The typical form occurs in the northern part of Brazil, the Guianas, Trinidad, and Venezuela, its exact geographic limits are uncertain. Various authors have different opinions about the status of the other forms of the species (see Hershkovitz, 1949, pp. 450-451; Cabrera, 1958, pp. 97-98).

Specimens examined.

Suriname; between 1824 and 1836, H. H. Dieperink; RMNH, reg. no. 17551: holotype of *Thyroptera bicolor,* female, preserved in alcohol, skull extracted (= Jentink's 1888 *Th. tricolor,* no. b).

Paramaribo; September 30, 1898, I. Michaelis; ZMH, Nr. 23519: juv. female, preserved in alcohol, strongly damaged skull extracted.

Marowijne River; 1877, C. Schneider; RMNH, reg. no. 17553: male, damaged skeleton and skull (= Jentink's 1887 *Th. tricolor,* no. a).

Suriname; between 1824 and 1836, H. H. Dieperink; RMNH, reg. no. 17552: male, preserved in alcohol, skull extracted (= Jentink's 1888 *Th. tricolor,* no. a).

Suriname; 1869, A. Kappler; SMN, Nr. 1301, 1-3: three females, preserved in alcohol, skulls extracted; Nr. 1301, 4: male, preserved in alcohol, skull inside.

Description. — Spix (1823, p. 61; pl. xxxvi fig. 6: animal, col. fig., dorsal view); Wagner (1843a); Cantraine (1845, pp. 492-495; col. plate, fig. 1: animal, ventral view; fig. 2: head, right side view; figs. 3-4: disk of the thumb); Dobson (1878, pp. 345-346); Miller (1896, p. 112); Miller (1907a, pp. 190-193); G. M. Allen & Barbour (1923, p. 272); Vieira (1942, pp. 387-390; fig. 33: animal, ventral view); Hershkovitz (1949, pp. 450-451); Goodwin & Greenhall (1961, pp. 274-276; fig. 88: under side of thumb and foot with disks; fig. 89: head, front view; pl. 30 figs. 4-6: skull).

Length of forearm varying from about 34 to 38 mm; ears separated, funnel-shaped; tragus small, curved inwards, with a prominent lobule near its base; at the base of the thumb of the hand and at that of the sole of the hindfoot a more or less circular suctorial disk is placed, the latter being always smaller than the former; interfemoral membrane large, when stretched reaching to the feet; calcar much longer than the foot, with two cartilaginous projections which are directed toward the posterolateral border of the interfemoral membrane; calcar of about the same length (8 mm) as the free border of the interfemoral membrane between tail and end of the calcar; hind foot short, about 5 mm, the third and fourth toes are ankylosed both

with the phalanges and the claws; the slender tail, which is enclosed in the interfemoral membrane, extends beyond the posterior border of this membrane with not more than one-third of its total length; the wing membrane from the base of the claw of the outer toes of the hind feet. The fur is rather

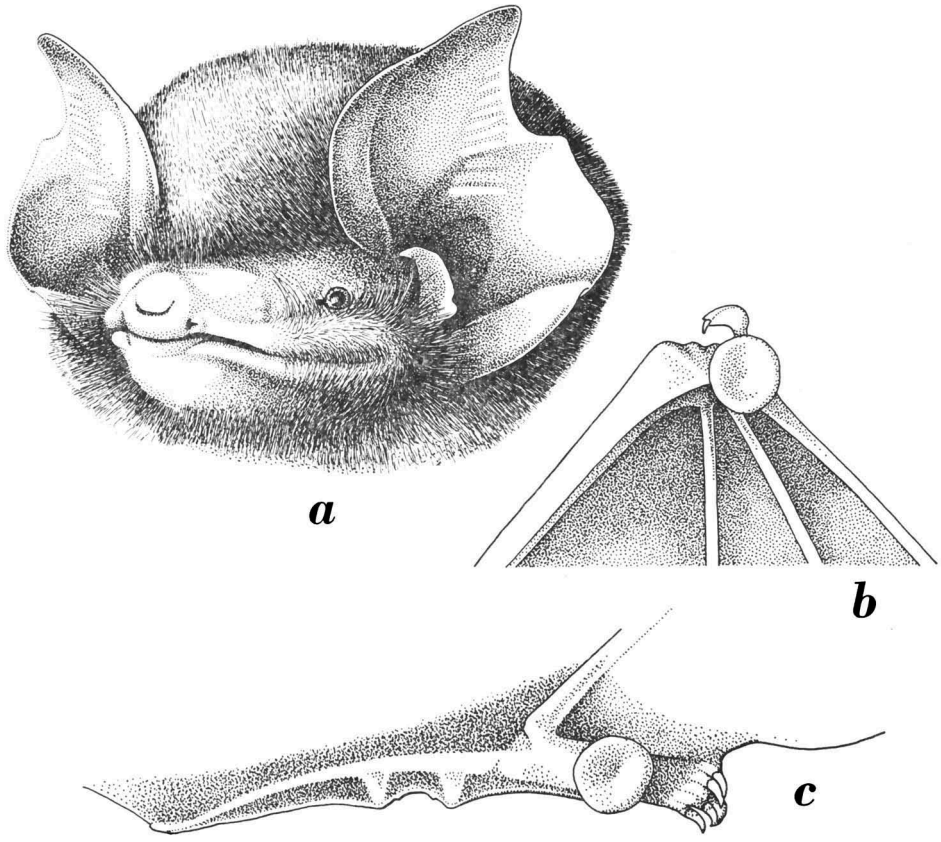

Fig. 32. *Thyroptera tricolor tricolor* Spix, SMN, Nr. 1301, 4. a, head b, thumb; c, hind foot.

long and dense; the interfemoral membrane is very thinly haired, the free margin is distinctly but thinly fringed with short hairs; the dorsal surface is dark brown to reddish brown; the entire ventral surface or its greater part is white, the white colour extending from the anus to the chin, the sides of the body and the lower lip are usually brownish, sometimes parts of the belly and the chest show a yellowish tinge; the ears are said to be blackish, the membranes dark brown.

Dental formula: $\frac{2.1.3.3}{3.1.3.3}$. Upper inner incisors widely separated from each other, with a distinct postero-external cusp; upper outer incisors unicuspidate or with a postero-external cusp, they are slightly smaller than the inner incisors and nearly in contact with them; they are separated from the slender canines by a distinct space; the first upper premolar is slightly smaller than the second, both are smaller than the large third premolar; the three premolars stand perfectly in the tooth-row and are in contact with each other or nearly so, the first premolar touches the canine, the third touches the first molar. The lower incisors are trilobed, the outer is slightly larger than the others; they form a continuous row between the canines; the lower canines are slender, small and low; the three lower premolars stand perfectly in the tooth-row, the first is slightly smaller than either the second or the third, which are of about the same size.

The external and skull measurements of six examined Suriname specimens are given in Table XXIII.

Remarks. — After examination of the holotype of *Thyroptera bicolor*, described by F. J. Cantraine [1]) on a single specimen from Suriname, I agree with previous authors that there is no good reason to separate Cantraine's species from *Th. tricolor*. The present species varies greatly in several of its characters as is shown by the eight Suriname specimens examined; the more important of these characters are dealt with below. Though Jentink (1888, p. 194) did not mention the date and collector of the holotype of *Th. bicolor* (the original label apparently being lost), it is obvious from Cantraine's (1845, p. 492) remark that the specimen was collected by H. H. Dieperink: "... celle que j'ai à faire connaître aujourd'hui, vit à Surinam, d'où elle a été rapportée par feu Dieperink, pharmacien militaire de la colonie". Further Cantraine noted on page 495 that his type is a male; this is an error since the type clearly is a female. The Leiden Museum possesses a second specimen of *Th. tricolor* collected by Dieperink in Suriname, which is a male; the figure given by Cantraine as well as the length of the forearm (stated by Cantraine to be 38 mm) agree so much better with the female specimen than

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1) The author of *Thyroptera bicolor*, François Joseph Cantraine, was born in Ellezelles, province of Hainaut, Belgium, 1801, and died in Ghent, Belgium, 1863. He got his zoological training at the University of Louvain, and at the Rijksmuseum van Natuurlijke Historie, Leiden. From 1823 to 1835 he was connected with the Leiden Museum, and made for that institute a collecting trip to Italy and the Adriatic (1827-1833). Soon after his return from Italy he was appointed professor of zoology at Ghent University, a position which he occupied till 1850, keeping a close contact with his friends at the Leiden Museum.

TABLE XXIII

External and skull measurements of six specimens of *Thyroptera tricolor tricolor* Spix from Suriname. RMNH reg. no. 17551 is the holotype of *Thyroptera bicolor* Cantraine.

Museum		RMNH	RMNH	SMN	SMN	SMN	SMN
Reg. number		17551	17552	1301,4	1301,1	1301,2	1301,3
Sex		♀	♂	♂	♀	♀	♀
Forearm		37.5	36.0	34.3	36.6	36.5	37.5
Third digit,	metacarpal	36	33.5	34	34.5	35.5	35.5
	1st phalanx	15	15	14	14	15.5	15
	2nd phalanx	9	8.5	8	8	10	9
	3rd phalanx	4	5	5.5	5	6.5	7
Fourth digit,	metacarpal	35	32	33	34	35	35
	1st phalanx	9	9	8	8	9.5	9
	2nd phalanx	5.5	6.5	6	7	6.5	6.5
Fifth digit,	metacarpal	33	30	30.5	30.5	32	32.5
	1st phalanx	9	8.5	7.5	8	9.5	9
	2nd phalanx	7	6	7	6.5	7	7.5
Tibia		17	17	16	17	16	19
Hind foot		5	5	5	5	5	5
Calcar		10	9.5	7.5	8	8	9
Tail		27	27	23	24.5	27	27
Free end of tail		7	6	5	5.5	4	2
Skull:							
greatest length		14.1	14.3	—	14.2	14.5	14.9
condylobasal length		12.7	13.1	—	13.4	13.5	13.7
condyle to front of canine		12.3	12.4	—	12.6	13.0	12.9
basal length		11.5	12.0	—	12.2	12.1	12.3
palatal length		6.3	6.7	—	6.9	6.9	7.0
zygomatic breadth		—	7.4	—	7.4	7.8	7.8
breadth of braincase		7.3	7.2	—	7.3	7.6	7.6
height of braincase		6.1	6.2	—	6.2	6.3	6.1
interorbital constriction		2.6	2.6	—	2.5	2.6	2.7
width across molars		5.1	5.1	—	5.2	5.2	5.3
width across cingula canines		—	2.8	—	2.8	2.9	2.8
upper tooth-row, c - m^3		5.5	5.6	—	5.6	5.8	5.8
lower tooth-row, c - m_3		6.0	5.8	—	5.8	6.0	6.1
length of mandible		—	10.2	—	10.4	10.5	10.6

with the male that there is no good reason to suppose that the two specimens have been interchanged.

The examined Suriname specimens are so strongly bleached that their original coat colour can no longer be ascertained; in the published descriptions of the species it is stated that the ears are blackish and the membranes dark brown. In my eight specimens one still can distinctly see that the greater part of the ventral surface of the body was white, strongly contrasting with the brownish colour of the dorsal surface. In some specimens the ventral surface seems to be entirely white, while in others a more or less distinct brownish band of varying width is present along the sides, the lower lip

having that same colour; in some specimens there is an indication that parts of the chest and belly are tinged with pale yellowish.

The length of the free end of the tail differs greatly in different specimens (Table XXIII), it varies from 2 to 7 mm, which is about 7 to 25 per cent of the total length of the tail.

Of the six entire skulls examined by me, three have the outer upper incisors with a distinct posterolateral cusp, while in three others this tooth is unicuspidate; in all these specimens the upper inner incisors have a posterolateral cusp, which is distinctly visible in side view.

In all specimens the circular suctorial disk of the thumb is larger than that of the sole of the hind foot; in my material the diameter of the disk of the thumb varies from 2.5 to 3 mm (mean 2.6 mm), that of the sole of the hind foot from 1.5 to 2 mm (mean 1.8 mm).

De Carvalho (1939) gave a most interesting account of the biology of *Thyroptera tricolor*.

Family VESPERTILIONIDAE

The Suriname Vespertilionidae can be distinguished from the other families of bats by the combination of the following characters: (1) the tail, about as long as the combined length of head and body, is entirely included within the wide interfemoral membrane; it ends at the posterior margin of that membrane or projects beyond it with only the extreme tip; the membrane, when stretched, reaches far beyond the outer toes (fig. 1b); (2) the third digit has three phalanges; (3) a nose leaf is absent, while the nostrils show no dermal outgrowths, and the lower lip no warts (fig. 33); (4) the inner upper incisors are separated from each other by a wide emargination of the anterior border of the palate (fig. 34; pls. XXIII-XXV).

At present six vespertilionid bats are known from Suriname; they can be identified with the help of the following key. The expression "free margin of the interfemoral membrane", used in the key indicates the part of the posterior margin of the membrane between the end of the calcar and that of the tail.

Key to the Suriname Vespertilionidae

1. One upper incisor on either side of the premaxillaries; this tooth in contact with the canine (fig. 34c and d). Dorsal surface of the interfemoral membrane distinctly pubescent 2
— Two upper incisors on either side of the premaxillaries; they are in contact with each other, but the outer is separated by a small space from the canine (fig. 34a and b; in these figures the space between outer upper incisor and canine does not show, because of the angle from which the figure is drawn) 3

2. Length of forearm usually more than 45 mm; width across cingula canines more than 5.5 mm. Interfemoral membrane loosely haired; general colour of the body brownish or yellowish brown . . . . . *Dasypterus ega ega*, p. 227
— Length of forearm varying from about 36 to 42 mm; width across cingula canines less than 5 mm. Dorsal surface of interfemoral membrane densely furred; general colour of the body bright reddish or reddish brown . *Lasiurus borealis frantzii*, p. 224
3. Wing membranes from the ankles; length of forearm about 46 mm . . . . . *Myotis surinamensis*, p. 218
— Wings from the bases of the outer toes; length of forearm less than 43 mm . . 4
4. Outer upper incisors much shorter and smaller than the inner, scarcely reaching to the cingulum of the canine (fig. 34b). Length of forearm varying from about 39 to 42 mm . . . . . *Eptesicus melanopterus*, p. 221
— Outer upper incisor of about the same size as the inner (fig. 34a). Length of forearm less than 39 mm 5
5. Tragus attenuated in its upper fourth, with a distinct rounded lobe at the base of its inner margin followed by a distinct emargination (fig. 33b), above which lies the broadest part of the tragus. Colour above and beneath of about the same brownish tinge . . . . . *Myotis nigricans nigricans*, p. 209
— Tragus of nearly the same width throughout, tapering slightly near the tip, the basal lobe indistinct (fig. 33d). Colour of the ventral surface much paler than that of the dorsal, especially so on the lower belly . . . . . *Myotis albescens*, p. 213

Myotis nigricans nigricans (Schinz)

(figs. 33a, b, 34a; pl. XXIII)

Vesp. (ertilio) nigricans Schinz, 1821, Das Thierreich, vol. 1, pp. 179-180.
? "Neue Gattung Nr. 2.", Lammens, 1844, Isis 1844, pp. 109-110.

Type locality. — In the original description by Schinz (1821, p. 180) noted as "Ostküste von Brasilien". Wied (1826, vol. 2, p. 268), who collected the type material, gave a more detailed indication: "Diese kleine Fledermaus erhielt ich auf der *Fazenda de Agá*, in der Gegend des Flusses *Iritiba* oder *Reritigba*" (Espirito Santo State).

Distribution. — The range of the species extends from Argentina, southern Brazil and southeastern Peru northward through northern South America and Central America to northeastern Mexico, it occurs also on the Lesser Antilles (see Hall & Kelson, 1959, pp. 176-177, and map 131; Cabrera, 1958, p. 101). The typical form inhabits South America, the Lesser Antilles, and Central America as far as Guatemala.

Specimens examined.

Paramaribo; August 9, 1950, D. C. Geijskes; RMNH, reg. no. 17632: one female, preserved in alcohol, skull extracted; reg. no. 17633: young male, preserved in alcohol, skull inside.

Paramaribo; October 24, 1950, D. C. Geijskes; RMNH, reg. no. 17103: one male, preserved in alcohol, skull extracted.

Garnizoenspad, Paramaribo; August 26, 1961, D. C. Geijskes; RMNH, reg. no. 17279: one female, preserved in alcohol, skull extracted.

Tempati Creek, Commewijne River basin, N. E. Suriname; August 27, 1961, K. H. Voous; ZMA, no. 4468: young male, preserved in alcohol, skull extracted.

Suriname; date and collector unknown; ZMA, no. 1518: one female, preserved in alcohol, skull extracted.

Brazil; date unknown, J. C. Natterer; RMNH, reg. no. 17621: lectotype of *Vespertilio parvulus* Temminck, dried skin in poor condition, some skull fragments (= Jentink's 1887 and 1888 *V.nigricans,* no. a).

Description. — Schinz (1821, pp. 179-180); Wied (1826, vol. 2, pp. 266-269); Dobson (1878, pp. 319-320; pl. xix fig. 8: ear, right side view); Miller & Allen (1928, pp. 175-181; pp. 184-185: table of external measurements; pp. 187-188: table of skull measurements); Vieira (1942, pp. 396-399; fig. 34: animal, ventral view); Goodwin & Greenhall (1961, pp. 276-277, fig. 90: head, front view; fig. 91: upper incisors and canines, front view; pl. 30 figs. 7-9: skull). The original description by Schinz (1821) is extremely short, but the species has been extensively dealt with by Wied (1826). Miller & Allen (1928) gave a revision of the American species of the genus *Myotis,* with elaborate notes on the present species.

Length of forearm varying from 32 to 39 mm (mean about 36 mm); ears rather narrow, about 12 mm in length, in the middle abruptly narrowed into a broadly rounded tip; the outer margin emarginate in its distal half, inner margin evenly curved; tragus about half as high as the ear, broadest in about its middle, strongly attenuated in the upper fourth and acutely pointed, with a distinct rounded lobule at the base of the outer margin; interfemoral membrane large, when stretched reaching far beyond the toes; tail wholly included in the interfemoral membrane, and ending in the posterior margin of the membrane; calcar about as long as the free margin of the interfemoral membrane, usually ending in a small projecting lobule; wing membrane from the base of the outer toe; length of hind foot usually shorter than half the length of the tibia. Fur soft and dense. Dorsally it extends on the wing membrane as far as a line connecting the middle of the upper arm and the knee; the fur on the interfemoral membrane covers a triangular area, the top of which lies on the tail, about at the level of the knees, the basis being formed by the proximal part of the membrane. Ventrally the fur extends on the wing and interfemoral membranes, but the pubescence here is much shorter than on the dorsal surface. Dorsally the hairs are blackish plumbeous for their greater part, the tips are dark brownish; on the ventral surface the tips of the hairs are more buffy or yellowish brown. The wing membranes are blackish brown.

Dental formula: $\frac{2.1.3.3}{3.1.3.3}$. Upper incisors about equal in size, the inner separated from each other by a wide anterior emargination of the palate; the

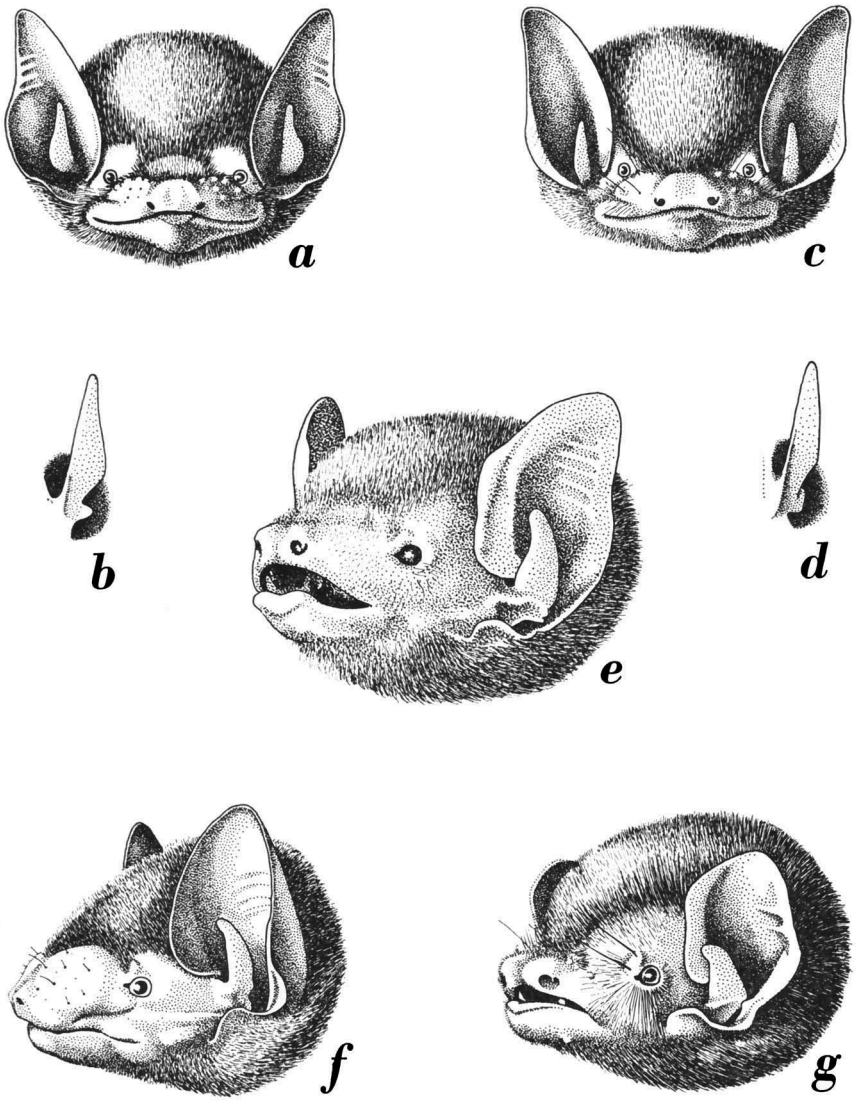

Fig. 33. a, *Myotis nigricans nigricans* (Schinz), ZMA, no. 4468; b, the same, tragus; c, *Myotis albescens* (E. Geoffroy), SMN, Nr. 264-861 1/2; d, the same, tragus; e, *Dasypterus ega ega* (Gervais). RMNH, reg. no. 17370; f, *Eptesicus melanopterus* (Jentink), SMN, Nr. 264a; g, *Lasiurus borealis frantzii* (Peters), RMNH, reg. no. 17282.

outer incisors are separated by small spaces from the canines; first upper premolar small, of about the same size as the inner upper incisor, in contact with the canine; the much smaller second premolar usually stands in the

tooth-row, but sometimes it is crowded inward so that the first and the third premolar are then close together; the third upper premolar large, its base as wide as that of the canine, about three-fourths as high as the canine and distinctly higher than the crown of the first upper molar. Lower incisors faintly trifid, forming a continuous row between the canines, the third wider than the first and the second; first lower premolar about half as high as the canine, somewhat larger than the small second premolar, both teeth are distinctly smaller than the large third premolar; the base of the third lower

TABLE XXIV

External and skull measurements of four specimens of *Myotis nigricans nigricans* (Schinz) from Suriname.

Museum	RMNH	RMNH	RMNH	ZMA
Reg. number	17103	17279	17632	1518
Sex	♂	♀	♀	♀
Forearm	34.3	32.5	34.1	33.2
Third digit, metacarpal	32.5	31	32.5	30
1st phalanx	12	11.5	12	10
2nd phalanx	10.5	10	11	9.5
3rd phalanx	7	5.5	5	5.5
Fourth digit, metacarpal	32	30.5	32	29
1st phalanx	9	9.5	10	9
2nd phalanx	8	9.5	8	8
Fifth digit, metacarpal	30	28.5	31	28.5
1st phalanx	8.5	8	8.5	7
2nd phalanx	7	7	7	7.5
Tibia	14.5	14	15	14.5
Hind foot	7	7	7	7
Skull:				
greatest length from i^1	13.4	12.7	13.6	12.7
condylobasal length	12.7	11.6	12.7	12.1
condyle to front of canine	11.9	11.2	12.1	11.2
basal length from i^1	11.2	10.5	11.1	10.6
palatal length from i^1	6.4	—	—	—
zygomatic breadth	—	—	—	8.0
breadth of braincase	6.7	6.2	6.6	6.3
height of braincase	5.1	4.7	4.8	4.7
mastoid breadth	6.8	6.6	7.1	6.7
interorbital constriction	3.4	3.3	3.5	3.2
width across molars	5.3	5.1	5.4	5.3
width across cingula canines	3.2	3.2	—	3.2
upper tooth-row, c-m^3	4.8	4.6	4.9	4.5
lower tooth-row, c-m_3	5.2	4.9	5.2	4.8
length of mandible	9.2	8.8	9.7	8.7

premolar is about as wide as that of the canine, its height is about three-fourths that of the canine, but is slightly greater than that of he first lower molar. The three lower premolars form a continuous row, but sometimes

the second premolar is slightly crowded inward. The sagittal crest is weakly developed, in some specimens it is sharply defined, but in others hardly visible.

The external and skull measurements of four specimens from Suriname are given in Table XXIV.

Remarks. — It is very well possible that Lammens's (1844, pp. 109-110) description of his "Neue Gattung Nr. 2" was based on material of *Myotis nigricans*. His description is as follows: "Länge 1¾", Flugweite 7½, Schwanz 1. Ihre Schnauze ist sehr regelmässig; die Ohren behaart, spitzig und aufgerichtet; der Schwanz steckt gänzlich in der Flughaut. Sie ist ganz schwarz". Lammens gave no scientific name to the species.

The type of *Vespertilio parvulus* Temminck is still present in the Leiden Museum. This species was described by Temminck (1840, vol. 2, pp. 246-247) from "Brésil", where it was collected by J. C. Natterer. Temminck's description was based on "sujets du Musée de Vienne et des Pays-Bas". I select now the Leiden Museum specimen as the lectotype of *V. parvulus*; it bears the reg. number 17621. As far as known to me Dobson (1878, p. 319) was the first author who placed *V. parvulus* in the synonymy of *V. nigricans*. The dried skin and the few skull fragments of the lectotype of *V. parvulus* (among which the left upper tooth-row is the only fragment of some taxonomic importance) do not give any indication that Dobson's action is incorrect, and therefore the two species are here considered identical. The tragus of the left ear is well preserved in the lectotype of *V. parvulus* and shows all essential pecularities characteristic of *Myotis nigricans*. The following measurements (in mm) of the specimen can be provided: forearm, 32.5; third metacarpal, 28.5; first phalanx, 10.5; second phalanx, 8.5; fourth metacarpal, 28.5; first phalanx, 8; fifth metacarpal, 28; first phalanx, 7.5; length of upper tooth-row, c-m^3, 5.0.

Myotis albescens (E. Geoffroy)

(figs. 21e, 33c, d; pl. XXIII)

Vesp. (ertilio) albescens E. Geoffroy, 1809, Annales Mus. Hist. Nat., Paris, vol. 8, pp. 204-205.

? "Nr. 365. Die Zwergfledermaus", Lammens, 1844, Isis 1844, p. 109.

Vespertilio arsinoe Temminck, 1840, Monographies de Mammalogie, vol. 2, pp. 247-248.

Vespertilio arsinoë, Kappler, 1881, Holländisch-Guiana, p. 163.

Vespertilio arsinoë, Jentink, 1887, Mus. Hist. Nat. Pays-Bas, vol. 9, p. 283; 1888, vol. 12, p. 192.

Type locality. — E. Geoffroy (1809) stated that his new species is based on "la chauve-souris douzième ou la chauve-souris brune-obscure de M. d'Azzara", so that the type locality must be Paraguay; as shown by Cabrera

(1958, p. 103) the actual type locality is "Estancia de San Solano, en el extremo sur del Paraguay, frente al Estero del Iberá".

The type locality of *Vespertilio arsinoe* is "Surinam".

Distribution. — The present species occurs from Nicaragua east- and southward through Central and South America all the way to Patagonia (see Hall & Kelson, 1958, pp. 177-178, and map 132; Cabrera, 1958, p. 103).

Specimens examined.

Suriname; date and collector unknown; RMNH, reg. no. 17635: holotype of *Vespertilio arsinoe* Temminck, female, dried skin in poor condition, damaged skull (= Jentink's 1887 and 1888 *V. arsinoë*, no. a).

Suriname; between 1824 and 1836, H. H. Dieperink; RMNH, reg. nos. 17636 and 17637: sex unknown, dried skins, skulls inside (= Jentink's 1888 *Vespertilio arsinoë*, nos. b and c).

Suriname; between 1844 and 1860, A. Kappler; SMN, Nr. 264a-861½, 1 and 4: two males, preserved in alcohol, skull fragments only; 2, 3, and 5: three females, preserved in alcohol, skulls extracted (except no. 2, fragments only).

Paramaribo; May 6, 1908, C. Heller; ZMH, Nr. 38805: one male, preserved in alcohol, strongly damaged skull extracted.

Garnizoenspad, Paramaribo; August 26, 1961, D. C. Geijskes; RMNH, reg. no. 17278; juvenile female, dried skin and damaged skull.

Description. — E. Geoffroy (1809, pp. 204-205); Dobson (1878, pp. 326-327: *Vespertilio albescens*; p. 328: *V. arsinoë*); Miller & Allen (1928, pp. 200-205); Vieira (1942, pp. 402-404).

Length of forearm varying from 33.8 to 37.4 mm; ear about 13 mm long, its outer margin not abruptly emarginate distally as in *Myotis nigricans* (see fig. 33c and d); tragus nearly of the same width throughout, tapering slightly at the tip, not reaching the middle of the ear conch, without a distinct basal lobe; interfemoral membrane well developed, when stretched reaching far beyond the toes; tail wholly enclosed in the interfemoral membrane, the extreme tip projecting free beyond the posterior margin of the membrane; wing membrane from the base of the outer toes; length of hind foot usually slightly more than half the length of the tibia. Fur soft and dense. Dorsally it extends on the wing membrane as far as a line connecting the basal third of the upper arm and the knee; also the basal part of the interfemoral membrane is pubescent. On the ventral surface the wing membrane is furred from the elbow to the knee; the extreme basal part of the ventral surface of the interfemoral membrane is densely haired, while short hairs are present in the rest of the basal half of this membrane. The basal three-fourths of the hairs of the dorsal surface are dark greyish brown, the tips are more buffy; the hairs of the ventral surface have the basal three-fourths dark brown, while the tips are yellowish or ashy, which colour passes into white on the lower belly. The wing membranes are blackish brown.

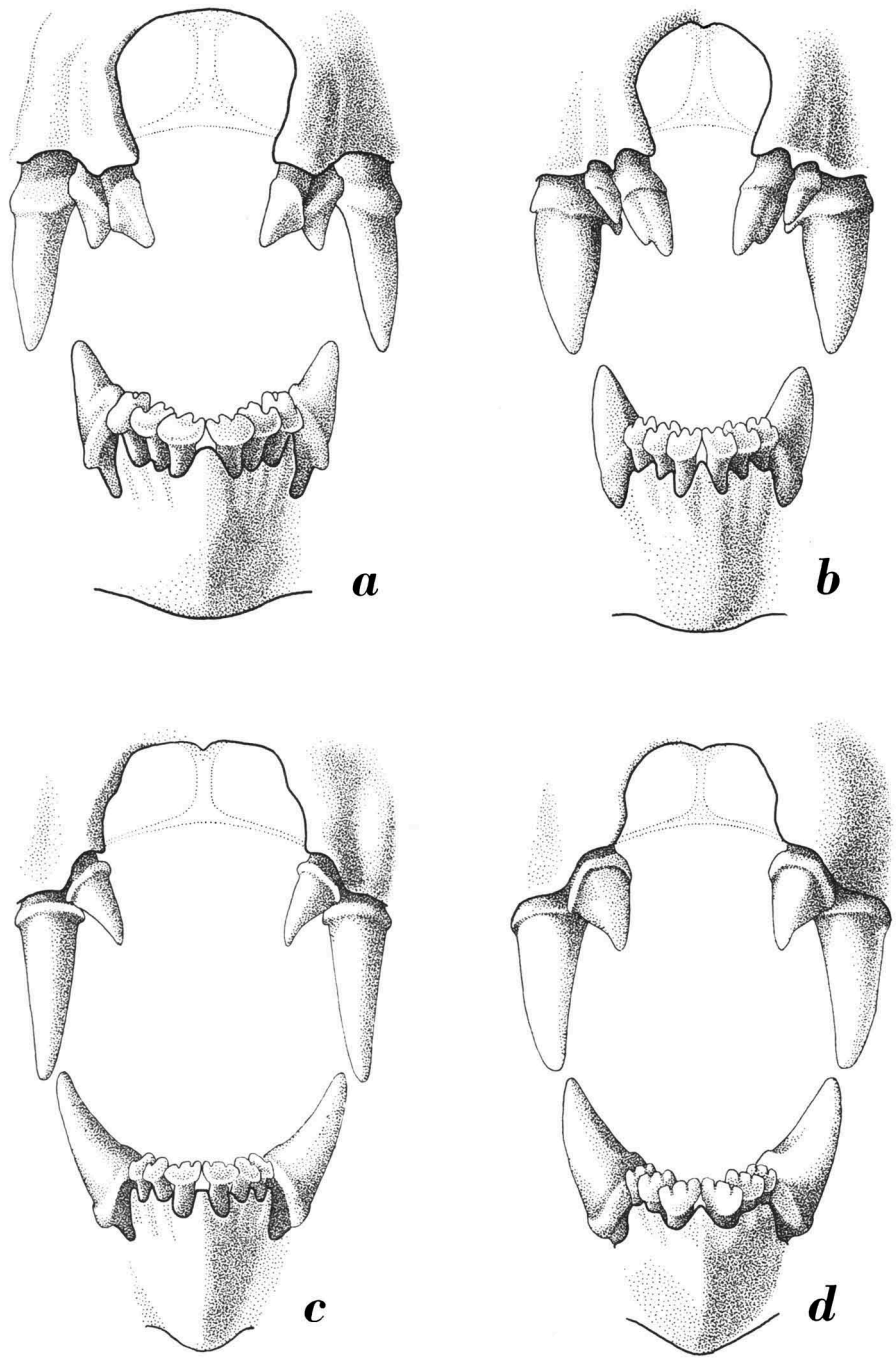

Fig. 34. Canines and incisors in front view. a, *Myotis nigricans nigricans* (Schinz), RMNH, reg. no. 17279; b, *Eptesicus melanopterus* (Jentink), SMN, Nr. 264a; c, *Lasiurus borealis frantzii* (Peters), RMNH, reg. no. 17282; d, *Dasypterus ega ega* (Gervais), RMNH, reg. no. 17371. Width across cingula canines in mm: a, 3.2; b, 4.6; c, 4.2; d, 6.1.

Dental formula: $\frac{2.1.3.3}{3.1.3.3}$. Teeth essentially like those of *Myotis nigricans nigricans*. The interorbital region as well as the breadth of the braincase are both relatively and absolutely wider than in that species.

The external and skull measurements of four specimens from Suriname are given in Table XXV.

TABLE XXV

External and skull measurements of four specimens of *Myotis albescens* (E. Geoffroy) from Suriname. RMNH reg. no. 17635 is the holotype of *Vespertilio arsinoe* Temminck.

Museum	RMNH	SMN	SMN	ZMH
Reg. number	17635	264a,2	264a,3	38805
Sex	♀	♀	♀	♂
Forearm	34.5	35.6	36.5	34.1
Third digit, metacarpal	—	31.5	33.5	32.5
1st phalanx	—	12	11.5	12
2nd phalanx	—	10	9	10.5
3rd phalanx	—	5.5	5	5.5
Fourth digit, metacarpal	—	31.5	33	31
1st phalanx	—	9	9	9.5
2nd phalanx	—	9	10	10.5
Fifth digit, metacarpal	—	31.5	33	31
1st phalanx	—	8.5	8.5	8
2nd phalanx	—	7.5	7	7.5
Tibia	—	14.5	15	15.5
Hind foot	—	7.5	8	8
Skull:				
greatest length from i^1	13.6	13.4	—	—
condylobasal length	12.7	12.5	—	—
condyle to front of canine	12.0	12.0	—	—
basal length from i^1	—	11.2	—	—
palatal length from i^1	—	6.6	—	—
zygomatic breadth	—	—	—	—
breadth of braincase	7.0	6.8	—	—
height of braincase	—	5.4	—	—
mastoid breadth	7.0	7.2	—	—
interorbital constriction	3.7	3.7	—	—
width across molars	5.4	5.3	—	—
width across cingula canines	3.5	3.2	3.4	3.7
upper tooth-row, c-m^3	4.7	4.8	4.9	5.1
lower tooth-row, c-m_3	5.1	5.2	5.2	5.3
length of mandible	9.5	9.7	9.8	9.8

Remarks. — Lammens's (1844, p. 109) description of "Nr. 365. Die Zwergfledermaus" agrees rather well with *Myotis albescens*. Lammens's identification of his material with *"Vespertilio pipistrellus"*, i.e., the European

Pipistrellus pipistrellus (Schreber) is of course incorrect as this species does not occur in the Americas; moreover Zimmermann (1780, vol. 2, pp. 413-414) explicitly stated that the species occurs "nicht nur in Frankreich und Deutschland, sondern auch im Casanischen". Lammens's description is as follows: "Die Länge dieses Thieres ist ungefähr 2‴, Flugweite 7, Schwanz 1½. Der Kopf gestreckt; die Ohren behaart, schmal und in die Höhe gerichtet, so lang als der Kopf; der Schwanz steckt ganz in der Flughaut und kann ¼‴ darüber herausragen. Er ist schwärzlich, schwach mit Weiss oder Gelblichweiss gewellt. Bauch grau. Sie hängt sich gern an Bäume über dem Wasser".

The holotype of Temminck's *Vespertilio arsinoe* (RMNH reg. no. 17635), an adult female, is in poor condition; the external measurements and also those of the skull are provided as far as it is still possible to take these (Table XXV). Dobson (1878, p. 328) gave an excellent redescription of the holotype to which I have nothing to add, while he noted also some external measurements of the specimen.

Miller & Allen (1928, p. 200, and p. 203) considered *Vespertilio aenobarbus* Temminck (1840, vol. 2, p. 247; pl. 59 fig. 4) to be a junior synonym of *Vespertilio albescens*. The holotype of Temminck's species is preserved in the Leiden Museum under reg. no. 17623. It is a female, preserved as dried skin, the very damaged skull has been extracted. The locality is unknown, Temminck found it in a "collection provenant de l'Amérique méridionale". Examination of the damaged skull of this type proved that it is specifically and even generically distinct from *Vespertilio albescens*. Its true systematic status is as yet not clear but later a comparison with other specimens may solve the problem.

The Suriname material at hand both of *Myotis nigricans nigricans* and *M. albescens* is too small to give a correct idea of the variation in the coat colour and the size of the animals, and of the variation in the position of the upper and lower premolars, characters which in the literature are reported to vary rather strongly in several populations of this species; the list of synonyms of the two species (cf. Miller & Allen, 1928) shows that many of these variants have been considered good species by older authors. The two species were separated by me on base of the following characters, which, as far as I can see, are especially useful for a quick identification: (1) the shape and size of the tragus, which is of the same width throughout in *M. albescens*, but is widened in *M. nigricans* (see fig. 33b and d), and (2) the absolutely and relatively wider interorbital constriction and braincase in *M. albescens* compared with those of *M. nigricans*: in the former species the interorbital constriction is usually more than 3.6 mm and the breadth of

the braincase more than 6.8 mm, while in *M. nigricans* these values are as a rule much lower.

Myotis surinamensis nov. nom.

(figs. 21f, 35; pl. XXIV)

Vespertilio ferrugineus Temminck, 1840, Monographies de Mammalogie, vol. 2, pp. 239-240; pl. 59 fig. 2: animal, dorsal view.

The name *Vespertilio ferrugineus* Temminck, 1840, is preoccupied by its senior primary homonym *Vespertilio ferrugineus* C. L. Brehm, 1827, which Ellerman & Morrison-Scott (1951, p. 161) provisionally consider to be a junior synonym of the typical form of *Nyctalus lasiopterus* (Schreber, 1780). For this reason the new specific name *Myotis surinamensis* is proposed here for Temminck's species.

Type locality. — "La Guyane hollandaise".

Distribution. — Besides the type specimen from Suriname, Jentink (1887, p. 281) mentioned in his "Catalogue ostéologique" a skeleton of the present species from "Amérique méridionale", without date or collector. In the literature at my disposal I found no other records of the species.

Specimens examined.

Suriname; between 1824 and 1836, H. H. Dieperink; RMNH, reg. no. 17363: lectotype, female, dried skin in poor condition, damaged skull (= Jentink's 1888 *Vespertilio ferrugineus,* no. a).

South America; date and collector unknown; RMNH, reg. no. 17364: damaged skeleton and skull (= Jentink's 1887 *Vespertilio ferrugineus,* no. a).

Description. — All authors who after 1840 dealt with the present species, gave a more or less literal citation of the original description, e.g., Wagner (1840, p. 526), Schinz (1844, pp. 178-179), Giebel (1859, p. 943), and Fitzinger (1870, pp. 84-86). Dobson (1878, pp. 296-297) described some characters of the teeth which are not mentioned by Temminck.

Since at present the type specimen is in a very poor condition not all external characters can be observed; for this reason the following description is partly based on those by Temminck and Dobson.

Length of forearm, 46.6 mm; ears shorter than the head; tragus reaching to nearly the middle of the ear; interfemoral membrane well developed, extending, when stretched, behind the foot, forming a very acute angle in the centre of its free posterior margin; tail projecting with the last vertebra; calcar long, its actual length in the dried skin can not be determined; wing membrane from the ankle; foot large, about three-fifths the tibia. Fur, present only on the body and on the interfemoral membrane at the base

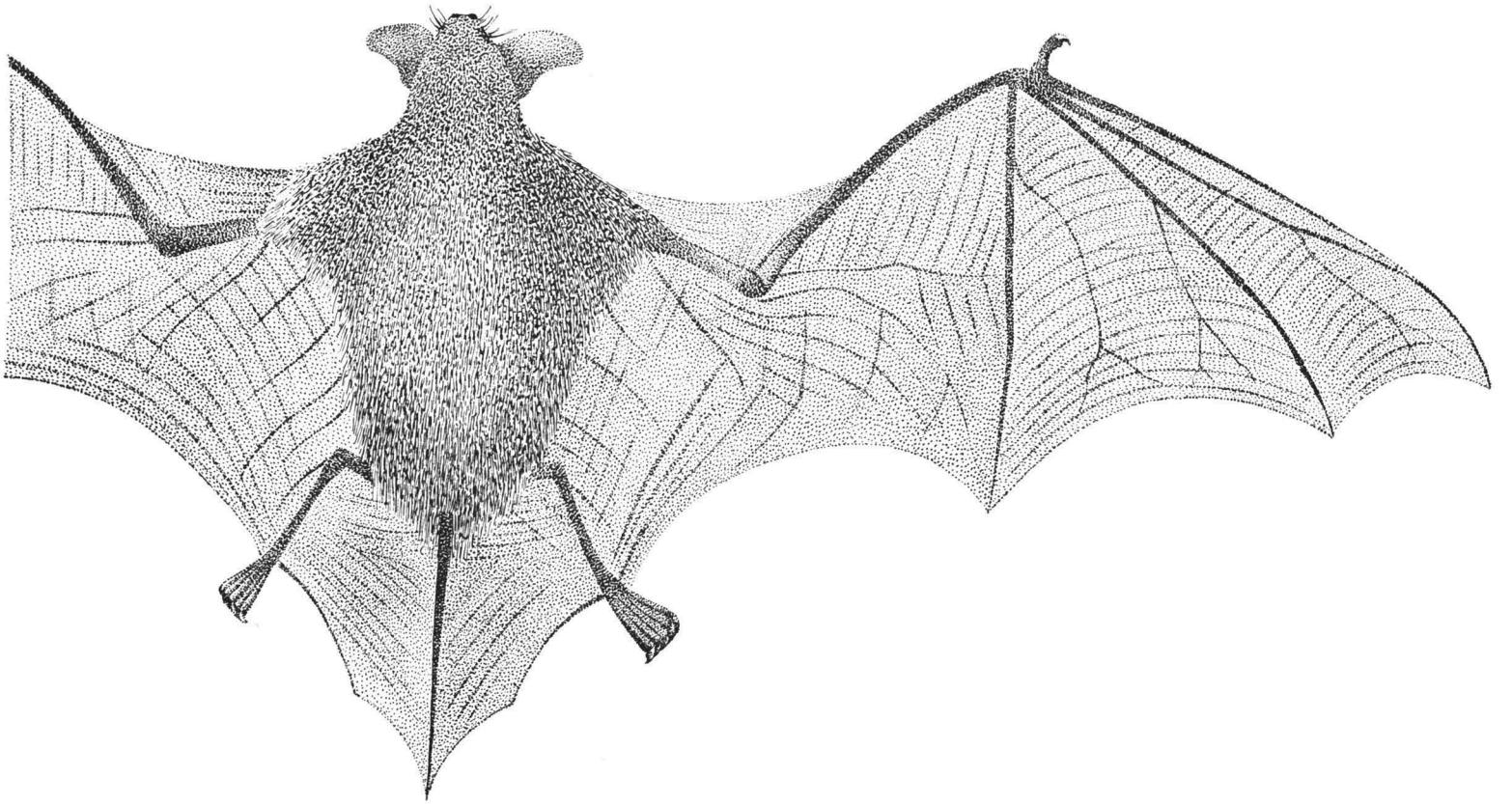

Fig. 35. *Vespertilio ferrugineus* Temminck [= *Myotis surinamensis* nov. nom.]. After Temminck, 1840, pl. 59 fig. 2. Original size.

of the tail, moderately long on the dorsal surface, shorter on the ventral parts, woolly; hairs distinctly bicoloured, on the upper parts the terminal third is light yellowish, the basal parts are dark, giving the whole surface a reddish brown tinge; the extremities of the hairs of the ventral surface are light greyish, the rest is dark brown, so that the whole under surface seems to be variegated with dark brown and ashy.

Dental formula: $\frac{2.1.3.3}{3.1.3.3}$. Upper incisors subequal in length, closely crowded; inner incisors separated by a large space, the base of their cingulum with a distinct posterior cusp, the cutting edge broad and oblique, being highest externally; outer incisors conical, separated from the canines by a distinct space equal to that between the canine and the third (large) premolar; first and second upper premolar small, drawn inwards from the tooth-row; second premolar the smallest, almost entirely hidden by the cingulum of the third premolar when viewed from the outer side. Lower incisors subequal, trifid, completely filling the space between the canines; the first and second premolars are small and stand perfectly in the tooth-row, the second is the smaller of the two.

The following are the external and skull measurements of the type of *Vespertilio ferrugineus*; in parentheses are given the skull measurements of the second examined specimen. Forearm, 46.6; length of third metacarpal, 44.5; first phalanx, 15.5; second phalanx, 18; length of fourth metacarpal, 43.5; first phalanx, 13; second phalanx, 9.5; length of fifth metacarpal, 41; first phalanx, 11; second phalanx, 8; ear, length, 12; ear, breadth, 9; tibia, 18; hind foot, 11.5; calcar, teste Dobson, 11.5; tail from anus, 45. — Skull: greatest length, — (16.8); condylobasal length, — (16.4); condyle to front of canine, — (15.4); basal length, from front of incisors, — (14.3); palatal length, from front of incisors, 9.2 (—); zygomatic breadth, — (—); breadth of braincase, — (8.7); height of braincase, — (6.2); mastoid breadth, — (9.2); interorbital constriction, 5.2 (5.0); width across molars, 7.2 (7.1); width across cingula canines, 5.2 (4.8); upper tooth-row, c-m^3, 6.7 (6.2); lower tooth-row, c-m_3, 7.1 (6.6); length of mandible, 13.3 (12.4).

Remarks. — In his "Catalogue systématique" Jentink (1888, p. 187) considered Temminck's plate 59 fig. 2 (animal, dorsal view; see fig. 35 in the present paper) to be made after the type in question. Temminck (1840, p. 240), however, noted that the description of *Vespertilio ferrugineus* was based on several spirit specimens ("basée sur la vue de plusieurs individus conservées à l'esprit de vin"). For this reason it is possible that the figure in question was not made after the type specimen dealt with here. It is unknown whether Temminck's "cotypes" have been exchanged with other

European museums, or must be considered lost. The present Leiden specimen is the only "cotype" known to me, and therefore I now select it to be the lectotype of Temminck's *Vespertilio ferrugineus*.

Jentink did not mention the skull of the type specimen; this probably means that at that time the skull was not removed from the mounted specimen. In a previous paper I commented upon the interchange of the skull of the type of Temminck's *Vespertilio harpia* and *V. ferrugineus* (see Husson, 1955, pp. 121-122) and I suggested that Dobson (1878, p. 297) probably studied the skull of the skeleton mentioned by Jentink. I am not fully convinced that this "South America" specimen is identical with the present species. Though the structure and the position of the teeth are identical in the two specimens, the teeth differ quite strongly in size. With the available material at hand it is difficult to decide whether or not the dimensions of the two specimens fall within the variation of the species.

There are differences of opinion among authors concerning the generic position of *Vespertilio ferrugineus*, caused by the fact that Temminck incorrectly described the dental formula as follows: "Dents incisives 4 par paire en haut; l'interne longue, large et en biseau; l'externe courte, bifurquée; 6 en bas; molaires supérieures 4, inférieures 5, dont une fausse". Dobson (1878) placed the present species in the subgenus *Leuconoë* of the genus *Vespertilio* on the basis of the dental formula and of certain external characters. In their revision of the American forms of the genus *Myotis*, Miller & Allen (1928, p. 20), however, based themselves on the dental formula as given by Temminck "which indicates probably an *Eptesicus*"; for this reason *Vespertilio ferrugineus* was not further dealt with by them. Without giving his reasons, Cabrera (1958, p. 105) placed the present species in the genus *Eptesicus* as a junior synonym of the typical form of *E. brasiliensis* (Desmarest). It is, however, evident that Temminck's species is a true *Myotis* belonging to the largest forms of American members of that genus. Judging by Miller & Allen's (1928, p. 205) account of *M. simus, M. ferrugineus*, though much larger, closely resembles that species which was described by Thomas (1901a, pp. 541-542) from Sarayacu, eastern Peru. According to Handley (1960, pp. 467-468), however, the most important characters given for *M. simus*, especially the insertion of the wing at the ankle, are either incorrectly described or are highly variable.

Eptesicus melanopterus (Jentink)

(figs. 21g, 33f, 34b; pl. XXIV)

Vesperus furinalis, Kappler, 1881, Holländisch-Guiana, p. 163 (non *Vespertilio furinalis* D'Orbigny & Gervais, 1847).

Vesperus melanopterus Jentink, 1904, Notes Leyden Mus., vol. 24, p. 176.
Eptesicus melanopterus, Sanborn, 1941, Field Mus. Nat. Hist., Zool. Ser., vol. 27, pp. 383-384.
Eptesicus melanopterus, Goodwin & Greenhall, 1961, Bull. Amer. Mus. Nat. Hist., vol. 122, p. 277.

Type locality. — "Paramaribo, Suriname".

Distribution. — The present species has been reported from Suriname and Tobago, and — if *Eptesicus chapmani* J. A. Allen, 1915, is a synonym — also from northeastern Brazil.

Specimens examined.

Paramaribo; September 1903, M. Greshoff; RMNH, reg. no. 12092: holotype, adult female, preserved in alcohol, damaged skull extracted.

Suriname; 1845, A. Kappler; SMN, Nr. 264 a: male and female, preserved in alcohol, skulls extracted.

Paramaribo; date and collector unknown; ZMH, Nr. 1860 a: female, preserved in alcohol, skull extracted.

Description. — Jentink (1904, p. 176); Miller (1907a, pp. 208-209); Sanborn (1941, p. 384); Goodwin & Greenhall (1961, pp. 277-278; fig. 92: head, front view; fig. 93: skull, rostrum, front view; pl. 31 figs. 1-3: skull).

Length of the forearm varying from 39.2 to 41.6 mm; ears and tragus well developed, the latter reaching to about one-third the length of the ear; interfemoral membrane well developed, when stretched it reaches behind the claws of the hind foot; tail extending to the posterior border of the naked interfemoral membrane, its free distal part about 2.5 mm long; wing membrane from the base of the outer toe; calcar well developed, with a narrow cutaneous margin, of about the same length as the tibia and about equal to the free margin of the interfemoral between the calcar lobe and the tail end. Upper parts uniformly cinnamon brown to dark brown, the extreme tips of the hairs yellowish; the basal half of the hairs of the under parts dark brown, the distal half whitish or light yellowish; wings dark brown; fur strictly confined to the body.

Dental formula: $\frac{2.1.1.3}{3.1.2.3}$. Inner upper incisors distinctly bifid, the inner cusp the highest; these two inner incisors are separated from each other by a distinct space, and are much larger than the outer upper incisors which they surpass for more than half their length; upper outer incisors separated from the canines by a space equal to the greatest diameter of one outer incisor; upper premolar large, more than half the size of the canine, in contact with both the canine and the first molar. Lower incisors trifid, completely filling the space between the canines; first lower premolar crowded in the tooth-row, about half the height of the second premolar, which

hardly exceeds the first molar in vertical extent; sagittal crest distinct but weakly developed.

The external and skull measurements of the four examined Suriname specimens are given in Table XXVI.

TABLE XXVI

External and skull measurements of four specimens of *Eptesicus melanopterus* (Jentink) from Suriname.

Museum		RMNH	SMN	SMN	ZMH
Reg. number		12092	264a	264a	1860a
Sex		♀	♂	♀	♀
Forearm		40.6	39.2	40.6	40.5
Third digit,	metacarpal	39	37.5	38	38.5
	1st phalanx	15	13.5	14.5	14.5
	2nd phalanx	13	11.5	11	12
	3rd phalanx	7	4.5	5	5
Fourth digit,	metacarpal	38	36.5	37.5	37.5
	1st phalanx	13	12	12	12
	2nd phalanx	9.5	9	7	9
Fifth digit,	metacarpal	36.5	36	36.5	36.5
	1st phalanx	9.5	8	9.5	8
	2nd phalanx	8	5	5.5	5.5
Ear, length × breadth		12 × 8.5	11 × 9	11.5 × 8	11 × 7.5
Tibia		16	15.5	16	16
Hind foot		8	8	9	8
Calcar		16	15	15.5	15
Skull:					
greatest length		—	15.5	15.4	16.0
condylobasal length		—	14.6	14.6	14.9
condyle to front of canine		—	14.1	14.1	14.5
basal length from front of i^1		—	13.1	13.0	13.2
palatal length from front of i^1		—	7.2	7.8	7.1
zygomatic breadth		—	10.9	—	—
breadth of braincase		—	7.3	7.3	7.7
height of braincase		—	5.8	5.8	5.9
mastoid breadth		—	8.1	7.9	8.8
interorbital constriction		—	4.0	3.6	4.0
width across molars		7.1	6.6	6.8	6.7
width across cingula canines		5.0	4.6	4.7	4.6
upper tooth-row, c - m^3		6.0	5.6	6.1	5.8
lower tooth-row, c - m_3		6.5	6.1	6.6	6.3
length of mandible		—	11.3	11.1	11.6

Remarks. — Since Jentink (1904, p. 176) did not extract the skull of the type, the description of his new species contains external measurements only; the few skull measurements of the type taken by me have been published for the first time by Goodwin & Greenhall (1961, p. 277). Sanborn (1941, p. 384), who examined a female from Zanderij, about 40 km south of Paramaribo, Suriname, provided the first skull measurements of *Eptesicus melanopterus*.

The place of the present species among the many described South American forms of *Eptesicus* is still uncertain (see Thomas, 1920b; Shamel, 1945, pp. 108-109; Koopman, 1958, p. 438; Goodwin & Greenhall, 1961, p. 278). Pending a revision of the genus I therefore consider *E. melanopterus* to be a good species. It is most probable, however, judging by the data given by J. A. Allen (1915, pp. 632-633) of his new species *E. chapmani* from north-eastern Brazil, that Allen's and Jentink's species are identical.

Shamel (1945, p. 109) suggested that *Vespertilio auripendulus*, described by Shaw (1800, p. 137) from "Guiana" might be identical with *Eptesicus melanopterus*. As clearly demonstrated by Goodwin (1960), Shaw's species is not an *Eptesicus*, but a recognizable and valid species of the genus *Eumops* (see page 243).

Lasiurus borealis frantzii (Peters)

(figs. 1b, 33g, 34c; pl. XXV)

Atalapha Frantzii Peters, 1871, Monatsber. Akad. Wiss. Berlin 1870, pp. 908-909. "Neue Gattung Nr. 1.", Lammens, 1844, Isis 1844, p. 109.

Type locality. — Peters's (1871, p. 909) type material originated from "Costa Rica" and "Brasilien". Though subsequent authors ignored the locality Brazil for the species, the first actual restriction of the type locality, as far as known to me, is the one by Miller & Kellogg (1955, p. 106), who definitely restricted it to Costa Rica.

Distribution. — *Lasiurus borealis* (Müller) has a very wide range of distribution, from the northern United States southward through the Greater Antilles, Central America, and northern South America to southern Brazil, Uruguay, Paraguay, and Argentina (see Hall & Kellogg, 1959, pp. 188-190, and map 139; Cabrera, 1958, pp. 112-113). The subspecies *L. borealis frantzii* inhabits the area from Costa Rica and Panama east and south to Colombia, Venezuela, Trinidad, the Guianas, Brazil (Minas Geraes, São Paulo, and Rio Grande do Sul), and Peru.

Specimens examined.

Paramaribo; August 17, 1944, D. C. Geijskes; RMNH, reg. no. 7490: one female, dried skin only.

Marowijne Nason, Suriname; February 23, 1952, D. C. Geijskes; RMNH, reg. no. 17568: one male, dried skin and skull.

Paramaribo; July, 1957, A. Hermanus; RMNH, reg. nos. 17282 and 17283: one male and one female, respectively, dried skins and skulls.

Coronie, coastal region west of the Coppename River; November 12, 1959, P. van Doesburg; RMNH, reg. no. 17205: one male, dried skin and skull; reg. nos. 17569 and 17570: one female and one male, respectively, preserved in alcohol, skulls extracted.

Paramaribo; September, 1961, D. C. Geijskes; RMNH, reg. nos. 17571 and 17572: one female and one male, respectively, preserved in alcohol, skulls extracted.

Description. — Peters (1871, pp. 908-909); Miller (1907a, pp. 221-222); Goldman (1932); Vieira (1942, pp. 418-420: *L. borealis mexicanus*; fig. 37: animal, ventral view); Handley (1960, p. 472; table 2: measurements); Goodwin & Greenhall (1961, pp. 278-279; fig. 94: head, front view; fig. 95: interfemoral membrane, dorsal view; pl. 32 figs. 1-3: skull).

Length of forearm varying from 36.0 to 41.3 mm; muzzle short and broad; ears, about 7.5 mm long and 4.5 mm broad, more or less rectangular, their tips broadly rounded; tragus about half the length of the ear, broad in the middle, the obtuse tip curved inwards; interfemoral membrane large, when stretched reaching far beyond the toes; tail wholly enclosed in the membrane, the extreme tip free; calcar about 16 mm, equal in length to the free margin of the interfemoral membrane; wing membrane from near the base of the outer toe. Fur soft and dense; dorsally it extends on the wing membranes as far as a line drawn from the basal third of the upper arm to the bases of the toes; on the membrane it is almost as thick and dense as on the body. In the basal third the interfemoral membrane is thickly covered with long hairs, this fur becomes gradually more loose; usually a distinct strip along the calcar and the free margin of the membrane is naked. On the ventral surface of the wing membrane the fur is thick and extends as far as a line drawn from the elbow to the knee; a narrow area behind the forearm is loosely haired, the fur being more dense in the angle between the forearm and the fifth digit and in that between the fifth and the fourth digits, extending to about the middle of the fifth metacarpal bone; the forearm is quite naked; the basal fifth of the interfemoral membrane is haired. The hairs of the back of the body are distinctly tricoloured; the basal fourth is blackish, followed by a broad streak of light yellowish, while the distal third is bright reddish; the hairs of the dorsal surface of the membranes are practically of a uniformly reddish colour. The colour of the ventral surface is much lighter than that of the back; the greater portion of the hairs, especially in the lower part of the body, are bicoloured: the terminal fourth is yellowish or buffy, the basal three-fourths are blackish or dark brown. The chin is reddish or yellowish red. The larger parts of the wings are dark brown; in sharp contrast to this colour there are buffy or yellowish streaks along the forearm and the digits, while also a very fine reticular pattern of this light colour may be seen on the rest of the membrane.

Dental formula: $\frac{1.1.2.3}{3.1.2.3}$. Upper incisors short and robust, in contact with the canine (fig. 34c); first upper premolar minute, situated in the inner angle between the canine and the large second premolar; second premolar half as long as the first molar, its height more than half that of the canine.

Lower incisors trifid, forming a continuous row between the canines; first lower premolar smaller than the second, in contact with the canine as well as with the second premolar. Skull short and broad; sagittal crest very weakly developed, sharply defined in its middle part only.

The external and skull measurements of seven specimens from Suriname are given in Table XXVII.

TABLE XXVII

External and skull measurements of seven specimens of *Lasiurus borealis frantzii* (Peters) from Suriname in the Leiden Museum.

Reg. number		17282	17570	17205	17568	17569	17283	17571
Sex		♂	♂	♂	♂	♀	♀	♀
Forearm		38.6	36.3	36.0	38.5	38.3	41.3	36.7
Third digit,	metacarpal	41	40	40	43	42	45	31.5
	1st phalanx	16	16	16	17	17	17	10
	2nd phalanx	18	16.5	17	18	17.5	18	10.5
	3rd phalanx	3	3	3.5	3.5	3.5	3.5	3.5
Fourth digit,	metacarpal	38.5	36.5	37	39.5	40	42.5	29.5
	1st phalanx	11	10.5	11	11.5	11.5	11.5	7.5
	2nd phalanx	11	11	11	11.5	13	11.5	9
Fifth digit,	metacarpal	35	33	32.5	36	36.5	38.5	28.5
	1st phalanx	8	7	7	8	7	7	6
	2nd phalanx	7.5	7.5	8	8.5	8	8	7
Tibia		—	20	—	—	21	—	16
Hind foot		—	9	—	—	10	—	8
Calcar		14	16	17	16	14	16	12
Tail, approximately		40	42	40	46	—	50	30
Skull:								
greatest length		11.5	11.7	11.7	11.7	11.8	11.9	11.7
condylobasal length, from i		11.1	11.2	10.8	11.4	11.6	11.8	11.3
condyle to front of canine		11.0	11.2	10.8	11.4	11.5	11.8	11.0
basal length, from i		9.7	9.4	9.3	9.9	9.7	10.0	9.9
palatal length, from i		4.7	4.7	4.6	5.1	5.0	5.2	5.2
zygomatic breadth		8.1	8.4	8.5	8.9	9.0	8.9	9.1
breadth of braincase		7.3	7.3	7.3	7.1	7.3	7.5	7.4
height of braincase		5.6	5.5	5.6	5.5	5.6	5.8	5.6
mastoid breadth		7.4	7.3	7.3	7.4	7.6	7.6	7.2
interorbital constriction		4.5	4.1	4.2	4.3	4.2	4.2	4.3
width across molars		5.1	5.2	5.2	5.3	5.4	5.5	—
width across cingula canines		4.1	4.1	4.2	4.3	4.4	4.4	—
upper tooth-row, c - m^3		3.8	3.7	3.8	3.9	3.9	4.1	4.0
lower tooth-row, c - m_3		4.4	4.2	4.4	4.4	4.5	4.4	4.6
length of mandible		8.1	8.4	8.3	8.4	8.7	8.8	—

Remarks. — The description by Lammens (1844, p. 109) of his "Neue Gattung Nr. 1." agrees so well with *Lasiurus borealis frantzii* that there can be hardly any doubt that he had this species before him. Lammens's diagnosis runs as follows: "Länge 2", Flügelweite 11, Schwanz 2. Diese Fledermaus unterscheidet sich durch ihren kleinen, runden Kopf und ihre Rostfarbe, welche ins Rothe spielt. Sie ist stark behaart, besonders auf dem Rücken; die schöne rostrothe Farbe wird gegen den Stand der Flügel dunkel und selbst

schwärzlich. Der Schwanz steckt ganz in der Flügelhaut; die Nase ist sehr klein, sowie die Ohren; der Kopf ganz behaart und das Maul wenig vorragend".

In the adult Suriname specimens of the present form the third metacarpal bone is distinctly longer than the forearm (see Table XXVII); in specimen no. 17571, however, the third metacarpal is much shorter than the forearm, though the measurements of the skull of this specimen suggest the adult condition of the animal, the phalangeal epiphyses are not ossified. The same three peculiarities are also observed in one Suriname specimen of *Dasypterus ega ega* (see Table XXVIII, ZMA no. 1524c). It seems probable that the relative shortness of the metacarpal is a juvenile character, and that the specimen, though the skull looks like that of an adult, actually is not full-grown. My material is, however, too scanty to give positive information on this point, while this phenomenon is not adequately treated in the literature.

Handley (1960, p. 473) remarked that the first upper premolar in one or both maxillae was absent in about 10 per cent of his material of *Lasiurus*. In the seven skulls of my Suriname material of *L. borealis frantzii*, however, this premolar is present.

According to Goodwin & Greenhall (1961, p. 278) the present species "roosts individually, hanging among the leaves of trees". My specimens from Combé, Paramaribo (RMNH, reg. nos. 17571 and 17572), were collected in a house along the Suriname river, while the three individuals from Coronie (RMNH, reg. nos. 17205, 17569, and 17570) were found together in a shrub of the genus *Thespesia*.

Dasypterus ega ega (Gervais)

(figs. 21h, 33e, 34d; pl. XXV)

Nycticejus Ega Gervais, 1856, Mammifères, in: Gervais & De Castelnau, Animaux nouveaux ou rares de l'Amérique du Sud, p. 73, pl. xiv fig. 1.

Type locality. — "Ega", Upper Amazon River, Brazil.

Distribution. — The species has a wide range of distribution, extending from southern California through Central America, and the mainland of South America, southward to Uruguay and northern Argentina (see Hall & Kelson, 1959, p. 194, and map 143; Cabrera, 1958, pp. 115-116). The typical form is known from the northern part of Brazil (Amazon River, and the Matto Grosso), Peru, and Bolivia, and is now reported for the first time from Suriname.

Specimens examined.

Suriname; between 1902 and 1910, D. G. J. Bolten; RMNH, reg. nos. 17370 and 17371: two females, dried skins and skulls.

Suriname; 1922, G. Stahel and J. W. Gonggrijp; ZMA, no. 1524c: one female, preserved in alcohol, skull extracted.

Berbice, British Guiana; 1893, C. G. Young; RMNH, reg. nos. 17638 and 17388: two females, dried skins and skulls.

Berbice, British Guiana; 1895, C. G. Young; RMNH, reg. nos. 17626, 17628, and 17629: three females, preserved in alcohol, skulls extracted.

Description. — Gervais (1856, p. 73; pl. xiv fig. 1: skull and teeth); Tomes (1857, pp. 42-43: *Lasiurus caudatus;* pp. 43-44: *L. Aga*); Dobson (1878, pp. 276: *Atalapha ega*); Miller (1907a, pp. 222-223); Thomas (1910f, pp. 246-247); Vieira (1942, pp. 424-425); Handley (1960, p. 574; table 4: measurements).

Length of forearm varying from 43.8 to 51.2 mm; muzzle short and broad; ears rhomboidal, about 14 mm long and 11 mm broad, with rounded tips; tragus broad, slightly more than half as long as the ear; interfemoral membrane large, when stretched reaching far beyond the toes; tail about as long as body and head together, wholly included within the interfemoral membrane, ending at the posterior margin of that membrane; calcar about as long as the free margin of the interfemoral membrane; wing membranes from the bases of the outer toes. Fur soft and silky, extending on the dorsal surface of the wing membranes as far as a line drawn from the middle of the upper arm to the knee; on the dorsal surface of the interfemoral membrane the fur covers the basal fourth and extends along the tail to about the middle; the legs are thinly haired. On the ventral surface of the wing membranes the fur extends as far as a line drawn from the elbow to the knee; a patch of short hairs is present in the angle formed by the forearm and the fourth metacarpal bone. In the basal third of the area of the tail the interfemoral membrane is ventrally covered with hairs. The hairs of the dorsal surface of the body may have a dark brown base, followed by a broad band of yellowish buff, and ending in a somewhat darker tip. The colour of the ventral surface is somewhat lighter, the hairs are brownish at the base, while the remainder is yellowish buff. The wing membranes are brownish with streaks of a lighter, whitish colour along the digits and also along the posterior margin; the hairs of the interfemoral membrane, both dorsally and ventrally, are similar to those of the body.

Dental formula: $\frac{1.1.1.3}{3.1.2.3}$. Teeth essentially similar to those of *Lasiurus borealis frantzii,* but the minute first upper premolar is always absent. The skull is more robust than in the previous species, while the sagittal crest, though weakly developed, is more distinct. For a comparison of the shape of the skulls of the two species plate XXV should be consulted.

The external and skull measurements of eight females from the Guianas are given in Table XXVIII.

TABLE XXVIII

External and skull measurements of eight females of *Dasypterus ega ega* (Gervais) from the Guianas.

Locality	Suriname	Suriname	British G.	British G.	British G.	British G.	British G.	Suriname
Museum	RMNH	RMNH	RMNH	RMNH	RMNH	RMNH	RMNH	ZMA
Reg. number	17371	17370	17638	17629	17628	17626	17388	1524c
Forearm	47.5	47.0	48	48.5	48.1	50.5	51.2	48.1
Third digit, metacarpal	52.5	54	56	55	56	58	59	43.5
1st phalanx	17.5	18.5	18.5	18	19	19	20	13.5
2nd phalanx	17	18	18.5	19.5	19	19	19	12.5
3rd phalanx	4	5	4.5	6	5	5	6	5
Fourth digit, metacarpal	49.5	50	52	51.5	52.5	55	56	40
1st phalanx	12.5	13	13.5	12.5	13.5	14	14	10
2nd phalanx	9	11	11	13.5	13	12	12	8.5
Fifth digit, metacarpal	42	42.5	45	44.5	45	48	48	37.5
1st phalanx	9	8	9	8	9	9	9	7.5
2nd phalanx	8	9	9.5	9.5	8.5	10	11	7.5
Tibia	20	20	—	22	20	22	21	19
Hind foot	—	9.5	—	9	9	9	9	10
Calcar	—	15	20	19	18	20	23	17
Tail, approximately	50	—	53	—	50	55	55	—
Skull:								
greatest length	15.3	—	15.8	15.6	16.2	16.3	16.5	15.7
condylobasal length from i	15.0	—	15.5	15.4	15.6	16.1	16.3	15.3
condyle to front of canine	14.8	—	15.4	15.4	15.6	16.1	16.1	15.1
basal length from i	13.3	—	13.7	13.4	14.1	14.1	14.3	13.5
palatal length from i	6.9	—	7.2	7.1	7.2	7.1	7.5	7.0
zygomatic breadth	11.1	—	11.3	11.5	11.8	11.5	11.7	—
breadth of braincase	8.5	—	8.6	8.2	8.5	8.7	8.5	8.1
height of braincase	6.8	—	7.0	6.7	7.0	7.0	7.0	6.6
mastoid breadth	9.1	—	9.0	9.2	8.9	9.6	9.7	8.9
interorbital constriction	4.6	—	4.5	4.6	4.5	4.5	4.7	4.8
width across molars	7.3	—	7.3	7.5	7.5	7.8	7.5	—
width across cingula canines	6.0	—	6.5	6.4	6.6	6.5	6.7	5.9
upper tooth-row, c - m^3	5.5	5.6	5.7	5.7	6.0	5.8	5.9	5.6
lower tooth-row, c - m_3	6.3	6.4	6.2	6.4	6.6	6.6	6.6	6.4
length of mandible	11.5	11.7	11.9	12.1	12.5	12.4	12.5	11.9

Remarks. — The description of *Nycticejus ega* Gervais was published in the sixteenth livraison of De Castelnau's "Expédition dans les parties centrales de l'Amérique du Sud"; according to Sherborn & Woodward (1901, p. 164) this livraison was probably published in 1856, though the title-page of the volume "Mammifères" is dated 1855.

The above mentioned British Guiana specimens are dealt with by Jentink (1893, pp. 278-279) under the name *Atalapha intermedia* Allen. As already noted under *Lasiurus borealis frantzii,* the specimen ZMA no. 1524c is aberrant since its external measurements show juvenile characters while the skull has adult peculiarities.

In *Dasypterus* like in *Lasiurus* the females have four mammae, while usually there are two or three young per litter (see Lyon, 1903; Handley, 1960, p. 473; Goodwin & Greenhall, 1961, p. 278); in this character the two differ from all other genera of the group. Handley (1960, p. 473) is of the opinion that there is no good reason to separate the genera *Lasiurus* and *Dasypterus,* not even on a subgeneric level. For the present, however, I prefer to retain the two taxa as distinct genera as accepted by most authors; the material seen by me is too scanty to form a definite opinion concerning Handley's arguments.

Family MOLOSSIDAE

The species of the family Molossidae can immediately be distinguished from all other Suriname bats by the thick tail, which for about half its length extends beyond the posterior margin of the well-developed interfemoral membrane. Other striking characters are: (1) the narrowness of the wings, caused by the fact that the length of the fifth digit equals that of the third metacarpal, (2) the short and broad hind foot, (3) the toes, which bear long curved prehensile hairs, (4) the thick ears, which (except in *Cynomops planirostris*) have their inner margins arising from one point on the forehead, sometimes being even joined together by a low band, (5) the shape of the muzzle, which is broad, obtuse, and obliquely truncated, resembling that of a mastiff or toad (old Dutch and German vernacular names for this group are "hondsbek" and "Hundsmaul"). The calcar ends indistinctly, so that its length (a character of great importance in other groups of bats) cannot be used to separate the species of this family. The wings are attached to the distal third of the tibia or to the ankles. The shape and the size of the tragus and of the antitragus in some cases prove to be characters of diagnostic value.

KEY TO THE SURINAME MOLOSSIDAE

1. Inner margins of both ears distinctly separated, thus not arising from one point on the forehead. Length of forearm varying from 31 to 33.5 mm. . . . . *Cynomops planirostris planirostris*, p. 231
— Inner margins of both ears arising from one point on the forehead or joined together by a low band. Length of forearm varying from 35 to 73 mm. 2
2. Upper lip with deep vertical grooves or wrinkles (see fig. 39a, b); anterior border of palate emarginate, separating the two inner incisors 3
— Upper lip smooth, without distinct vertical grooves or wrinkles (figs. 36, 39c, d); anterior border of palate without emargination, so that the inner incisors are not separated by a distinct space 4
3. Length of forearm varying from 40 to 45.5 mm . . . . *Tadarida europs*, p. 234
— Length of forearm varying from 56.5 to 64 mm . . . . *Tadarida macrotis*, p. 236
4. Antitragus circular, about as high as long. Only one large premolar in upper tooth-row; lower jaw with two incisors. In full-grown specimens the knife-like sagittal crest is greatly developed 5
— Antitragus half-oval or half-cordate, longer than high. Two premolars in upper jaw, the anterior being very small; lower jaw with four incisors 6
5. Length of forearm varying from 46 to 53 mm . . . . *Molossus ater ater*, p. 259
— Length of forearm varying from about 37 to 41 mm . . *Molossus molossus*, p. 251
6. Ventral surface of mesopatagium with a longitudinal area, about 5 mm wide, covered with white hairs, extending between proximal half of upper arm and that of thigh; this streak of white colour is sharply set off from the dark brown of the body. Length of forearm varying from 51 to 53 mm . . . . *Eumops geijskesi*, p. 246
— No streak of white hairs on ventral surface of mesopatagium 7
7. Length of forearm more than 65 mm . . . . . *Eumops trumbulli*, p. 248
— Length of forearm less than 65 mm. 8
8. Tragus linear, small, with rounded tip. Small first upper premolar crowded out of the tooth-row, so that canine and large second premolar are in contact with each other. Upper parts dark blackish brown, under parts more dark brown. Length of forearm varying from about 56 to 63 mm . . . *Eumops auripendulus auripendulus*, p. 240
— Tragus quadrate, small, superior margin straight. Minute first upper premolar in centre of space between canine and second premolar. Upper parts chestnut-brown with greyish tinge, under parts much paler. Length of forearm varying from 58 to 61 mm. . . . . *Eumops glaucinus*, p. 239

Cynomops planirostris planirostris (Peters)

(figs. 36a, 37a; pl. XXVI)

Dysopes abrasus, Temminck, 1841, Monographies de Mammalogie, vol. 2, p. 356 (non *Dysopes abrasus* Temminck, 1827).

Molossus (*Molossus*) *planirostris* Peters, 1865, Monatsber. Akad. Wiss. Berlin 1865, p. 575.

Molossus abrasus (p.p.), Jentink, 1888, Mus. Hist. Nat. Pays-Bas, vol. 12, p. 201.

Type locality. — The original description by Peters was based on specimens from British Guiana, from Barra do Rio Negro, Brazil, and from Buenos Aires. Thomas (1901e, pp. 190-191), when describing *Molossus planirostris paranus* from Pará, considered Guianan specimens of *Cynomops planirostris* to be the typical form; therefore it is apparent that British

Guiana, which moreover is the first locality mentioned by Peters, must be considered the restricted type locality of the species.

Distribution. — The typical form of the present species occurs in the northern part of South America, the Guianas, Colombia, and Panama.

Specimens examined.

Suriname; between 1824 and 1836, H. H. Dieperink; RMNH, reg. no. 13064: female, dried skin, strongly damaged skull extracted (= Jentink's 1888 *Molossus abrasus*, no. b).

New Amsterdam, Berbice, British Guiana; March, 1894, C. G. Young; RMNH, reg. no. 12899: adult male, dried skin and skull; reg. no. 12900: adult female, dried skin and skull.

Description. — The rather short original description by Peters (1865) was emended by Dobson (1876, pp. 707-708; 1878, pp. 408-409). The subgenus *Molossops* of Peters (1865c, p. 575) was given full generic rank by Miller (1907a, pp. 247-249; as pointed out by Goodwin (1958, p. 5), fig. 39 represents actually the skull of *Cynomops cerastes* (Thomas) and not of *Molossops planirostris*). Thomas (1920a, p. 189) divided the genus *Molossops*, mainly on basis of the numbers of lower incisors, in *Molossops* (two lower incisors) and *Cynomops* (four lower incisors).

Length of forearm varying from 31 to 33.5 mm; ears shorter than the head, the points of origin of the inner margins distinctly separated; tragus short, more or less triangular with a broad base; antitragus large, more or less square with rounded angles; calcar indistinct, at least in the examined specimens; about two-fifths of the tail project free beyond the posterior margin of the interfemoral membrane; wing membranes from the distal third of the tibiae. Fur soft and short; hairs of the dorsal surface rust brown, the bases being much lighter, varying from light yellowish to whitish; chin, neck and a broad longitudinal band on chest and abdomen whitish or light yellowish white, contrasting sharply with the rust brown sides of the ventral surface, which are of the same tinge as the dorsal surface; wings darker brown without the rubiginous tinge.

Dental formula: $\frac{1.1.1.3}{2.1.2.3}$. Upper incisors, about half the height of the canines, in contact at their bases, their tips diverging, separated by a distinct space from the canines; the large upper premolar in contact with the first molar, sometimes separated by a small space from the canine; lacrymal ridges conspicuous, projecting laterally. Lower incisors small, bifid, crowded, the inner placed before the outer, their height being much less than that of the cingulum of the canines; lower premolars, the first of which is not so high as the second, in contact with each other, the first also with the canine and the second with the first molar.

External and skull measurements of the two examined specimens from British Guiana, adult female and male, respectively. Forearm, 32, 32.5; length of third metacarpal, 33, 35; first phalanx, 15, 15; second phalanx, 13, 14; third phalanx, 3, 3; length of fourth metacarpal, 32.5, 34; first phalanx, 11, 10;

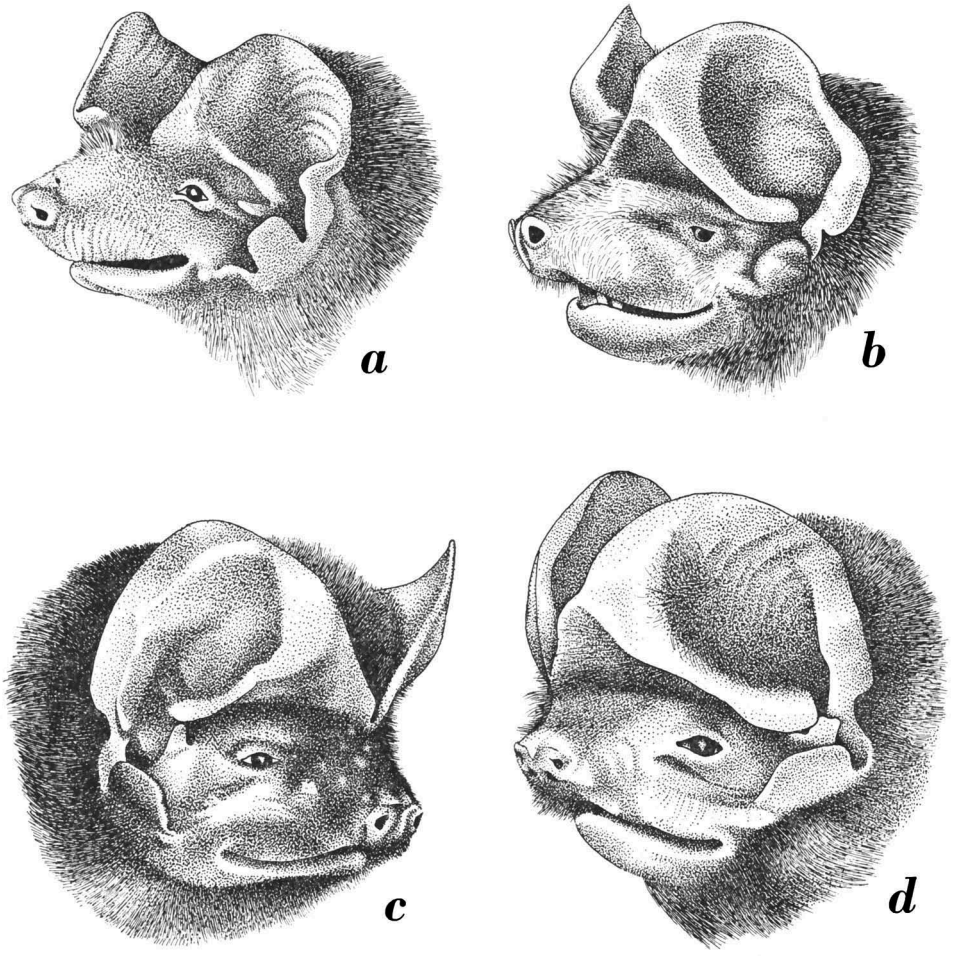

Fig. 36. a, *Cynomops planirostris planirostris* (Peters), BMNH, no. 80.11.29.4; b, *Eumops auripendulus auripendulus* (Shaw), BMNH, no. 52.1082; c, *Eumops geijskesi* nov. spec., RMNH, reg. no. 12943; d, *Eumops trumbulli* (Thomas), RMNH, reg. no. 13063.

second phalanx, 4.5, 4; length of fifth metacarpal, 20, 21; first phalanx, 9, 10; second phalanx, 3, 3; tail from anus, 30, 29. — Skull: greatest length, 15.6, 17.0; condylobasal length, 15.3, 16.2; condyle to front of canine, 14.8, 16.0; basal length, 13.2, 14.3; palatal length, 6.5, 7.5; zygomatic breadth,

10.7, 11.6; breadth of braincase, 8.3, 8.7; height of braincase, 5.8, —; mastoid breadth, 10.3, 11.7; interorbital constriction, 4.4, 4.3; width across molars, 7.3, 7.7; width across cingula canines, 4.2, 5.0; upper tooth-row, c-m^3, 6.1, 6.6; lower tooth-row, c-m_3, 6.5, 7.1; length of mandible, 11.1, 11.8.

Remarks. — *Cynomops planirostris planirostris* can at once be distinguished from all other Suriname Molossidae by (1) its smaller size, the length of the forearm varying from 31 to 33.5 mm, and (2) the whitish chin, neck, chest, and abdomen, which are sharply set off from the rust brown sides of the ventral surface.

The Suriname specimen of the Leiden Museum was dealt with by Temminck (1841, p. 356) in his "addition à l'article du *Dysopes abrasus*", where he treats it as a juvenile of that species. Though Temminck did not explicitly state that he received the specimen from H. H. Dieperink in Suriname, he mentioned Suriname now as an additional locality for this species, which was originally described from Brazil. The description by Temminck of the "juveniles" of *D. abrasus* fit very well for Dieperink's specimen: "Le pelage de ces jeunes est en dessus d'un marron-foncé; les parties inférieures couvertes de poils ras, ont les côtés du cou, les membres et les flancs d'un brun noisette; le devant du cou, la région thoracique et une partie du milieu du ventre sont blanchâtres". This description contains all essential characters of the coat colour of *Cynomops planirostris*. Furthermore Temminck noted that his "juveniles" have four lower incisors and that the ears are separated, characters which also point to *Cynomops*. Since Temminck did not extract the skull of his Suriname specimen it is understandable that he regarded this animal as a juvenile, while it actually is adult. See also under *Eumops auripendulus*, p. 246.

The generic status of *Cynomops* is disputable; Cabrera (1958, p. 118) and Goodwin & Greenhall (1961, p. 282) accept it as a subgenus of *Molossops*.

Tadarida europs (H. Allen)

(figs. 37b, 39b; pl. XXVII)

Nyctinomus europs H. Allen, 1889, Proc. Amer. Philos. Soc., Philadelphia, vol. 26, pp. 558-561.

Type locality. — "Brazil". Restricted by Cabrera (1958, p. 121) to "Corumbá, estado de Mato-Grosso".

Distribution. — The species has been reported from Brazil, Venezuela, and Trinidad, W.I.; now it is recorded for the first time from Suriname.

Specimens examined.

Near the junction of the Marowijne and Gonini Rivers, base camp of the Gonini Expedition 1903/1904; August 13, 1903, G. M. Versteeg; RMNH, reg. nos. 15918: male, dried skin and skull; 15919-15922: males, preserved in alcohol, skulls extracted (partly strongly damaged).

Rio Orinoco, right bank, mouth of Rio Ocamo, Venezuela; March 23, 1929, Olalla Brothers; AMNH, no. 78540: female, preserved in alcohol; no. 78280: female, dried skin and skull.

Rio Casiquinare, Amapure, Venezuela; March 19, 1929, G. H. H. Tate; AMNH, no. 77486: male, dried skin and skull.

Rancho Grande, Venezuela; 1945, W. Beebe; AMNH, no. 144384: male, preserved in alcohol.

Description. — H. Allen (1889, pp. 558-561; 1890a, pp. 635-638); Miller (1907a, pp. 251-253); Shamel (1931, pp. 14-15; tables: pp. 22 and 27); Vieira (1942, pp. 451-452); Goodwin & Greenhall (1961, pp. 284; fig. 105: head, front view; fig. 106: skull, dorsal view of rostrum; pl. 33 figs. 1-3: skull); Allen's 1890 paper is merely a reprint of his 1889 publication.

Length of forearm varying from 40 to 45.2 mm; upper lip with deep vertical grooves or wrinkles; ears large, rounded, inner margins arising from one point on the forehead (not united); tragus small, quadrate, upper margin straight, about 1 mm in length; antitragus about as long as high, up to 4 mm long; femur and basal part of tibia on the ventral surface concealed by a fold of the skin extending from the pubis to the lower third of the tibia, the hind foot and lower part of the tibia being visible only. Fur rather soft; dorsally behind the basis of the humerus the fur abruptly narrows inward, extending down to the basis of the tail; hairs of the dorsal surface uniformly auburn coloured, those of the ventral surface being lighter with light buff tips, in some specimens verging to white on the sides.

Dental formula: $\frac{1.1.2.3}{2.1.2.3}$. Teeth essentially like those of *Tadarida macrotis* (see under that species); the small first upper premolar, however, stands in the tooth-row and touches the canine as well as the large second premolar. Postorbital constriction of about the same width as the alveolar width across the canines; sagittal crest sharply defined, but scarcely developed.

External and skull measurements of two male specimens from Suriname (RMNH reg. nos. 15918 and 15919, respectively) are given here. In parentheses are added the external measurements of AMNH nos. 78540 (female) and 144384 (male), respectively, and the skull measurements of AMNH nos. 78280 (female) and 77486 (male), respectively. Forearm, 42.1, 42.9 (42.0, 42.5); length of third metacarpal, 43, 42.5 (42, 43.5); first phalanx, 19, 20 (20, 18); second phalanx, 15, 15.5 (16, 15); third phalanx, 7, 7 (6, 5.5); length of fourth metacarpal, 41.5, 41.5 (40, 41.5); first phalanx, 16, 17.5

(17.5, 16); second phalanx, 6, 4 (4, 3.5); length of fifth metacarpal, 24, 24.5 (24.5, 26.5); first phalanx, 13, 13.5 (13.5, 12.5); second phalanx, 5.5, 6 (6, 5); tibia, 12.5, 12 (12.5, 12.5); tail, from anus, 43, 42 (41, 40). — Skull: greatest length, 17.3, 16.9 (16.9, 17.0); condylobasal length, 16.6, 15.8 (15.8, 16.0); condyle to front of canine, 15.6, 15.4 (15.0, 15.3); basal length, from front of i, 14.9, 14.0 (13.4, 13.9); palatal length, from front of i, 7.3, 6.9 (6.4, 6.7); zygomatic breadth, 10.2, 9.6 (9.5, 9.6); breadth of braincase, —, 8.0 (8.2, 7.9); mastoid breadth, 9.9, 9.5 (9.4, 9.3); postorbital constriction, 3.5, 3.3 (3.3, 3.3); width across molars, 7.0, 6.9 (7.1, 7.3); width across cingula canines, 3.8, 3.7 (3.8, 3.9); upper tooth-row, c-m^3, 6.8, 6.4 (6.4, 6.6); lower tooth-row, c-m_3, 7.2, 6.8 (6.9, 7.2); length of mandible, 12.3, 11.8 (11.5, 11.4).

Remarks. — In the five male specimens of *Tadarida europs* examined from Suriname the length of the forearm varies from 41.3 to 44.9 mm. The Suriname material at hand agrees very well with the descriptions and the measurements of the species in the literature. The most striking external characters are (1) the presence of a fold in the skin from the pubis to the lower third of the tibia, by which the femur and the upper part of the tibia are concealed ventrally, and (2) the narrowing of the fur on the dorsal surface.

Tadarida macrotis (Gray)

(fig. 39a; pl. XXVII)

Nyctinomus macrotis Gray, 1839, Ann. Nat. Hist. or Mag. Zool. Bot. and Geol., vol. 4, pp. 5-6.

Nyctinomus megalotis Dobson, 1876, Proc. Zool. Soc. London 1876, pp. 728-729.

Type locality. — The type locality of *N. macrotis* is "Cuba", where the species was collected in "the interior of the island"; that of *N. megalotis* is "Surinam".

Distribution. — The species has a wide range of distribution, which extends from Paraguay and Brazil, through Ecuador, Colombia, the Guianas, and Central America to the United States, where it is found as far north as Iowa; the species occurs also on the Greater Antilles (Jamaica; Cuba; Dominican Republic).

Specimens examined.

Jamaica; date and collector unknown; BMNH, no. 9.1.4.52: female, preserved in alcohol, without skull.

Rio Xingu, Brazil; date and collector unknown; BMNH, no. 20.7.14.33: skull only.

Description. — Dobson (1876, pp. 728-729: *N. megalotis*; pp. 729-730: *N. macrotis*; fig. 6: head, left side view); Dobson (1878, pp. 434-435: *N.*

megalotis, pl. xxii fig. 5: head, right side view; pp. 435-436: *N. macrotis*, pl. xxii fig. 6: head, left side view); Miller (1907a, pp. 251-253; fig. 43: skull of *N. macrotis*); Shamel (1931, pp. 15-17; tables on pp. 23 and 27). Dobson's 1878 descriptions are identical with those of his 1876 paper.

Length of forearm varying from 56.6 to 63.8 mm; upper lip with deep vertical grooves or wrinkles; ears large and rounded, inner margins united by a low band on the forehead; tragus small, quadrate, superior margin straight, about 2 mm in length; antitragus nearly twice as long as high; free end of tail longer than the basal part, which is enclosed in the membrane; wing from the distal third of the tibia; well-developed pocket in interfemoral membrane at angle of femur and tibia. According to Dobson (1876, p. 729) the fur is "dark brown above and beneath, with slightly greyish extremities; the base of the hairs whitish"; the fur extends on the dorsal surface of the wing below the forearm as a narrow band of very short fine hairs, and on the dorsal basal part of the interfemoral membrane.

Dental formula: $\frac{1.1.2.3}{2.1.2.3}$. Anterior margin of palate emarginate; postorbital constriction about equal to the alveolar width across the canines; upper incisors, about half as high as the canines, separated from each other as well as from the canines by distinct spaces, which are of about equal width; first upper premolar small, conical, acutely pointed, placed in the rather wide space between the canine and the large second premolar, (usually?) nearer to the canine than to the second premolar; base of the second upper premolar about as long as that of the canine, the former not so high as the latter. Lower incisors crowded between the canines, distinctly bifid in the centre; first lower premolar not crowded, its base equals that of the second premolar, which is as high as the first lower molar.

The following are some external and skull measurements of the examined Jamaica skin and Brazil skull. In parentheses are given the measurements of the type of *N. megalotis* as published by Shamel (1931, pp. 23 and 27). Forearm, 56.6 (60.4); length of third metacarpal, 55; first phalanx, 22.5; second phalanx, 19.5; third phalanx, 6; length of fourth metacarpal, 52.5; first phalanx, 18; second phalanx, 4.5; length of fifth metacarpal, 26.5; first phalanx, 17.5; second phalanx, 8; ear, from notch, 22; tibia, 17 (17.0); hind foot, 10 (9.0); tail, from anus, 52 (57). — Skull: greatest length, 22.6 (24.0); condylobasal length, 21.1; condyle to front of canine, 20.3; basal length, from front of incisor, 19.4; palatal length, from front of incisor, 9.3; zygomatic breadth, 12.2 (13.0); breadth of braincase, 10.2 (10.4); height of braincase, 7.6; mastoid breadth, 11.2; postorbital constriction, 4.1; width across molars, 8.6; width across cingula canines, 4.6; upper tooth-row, c-m^3,

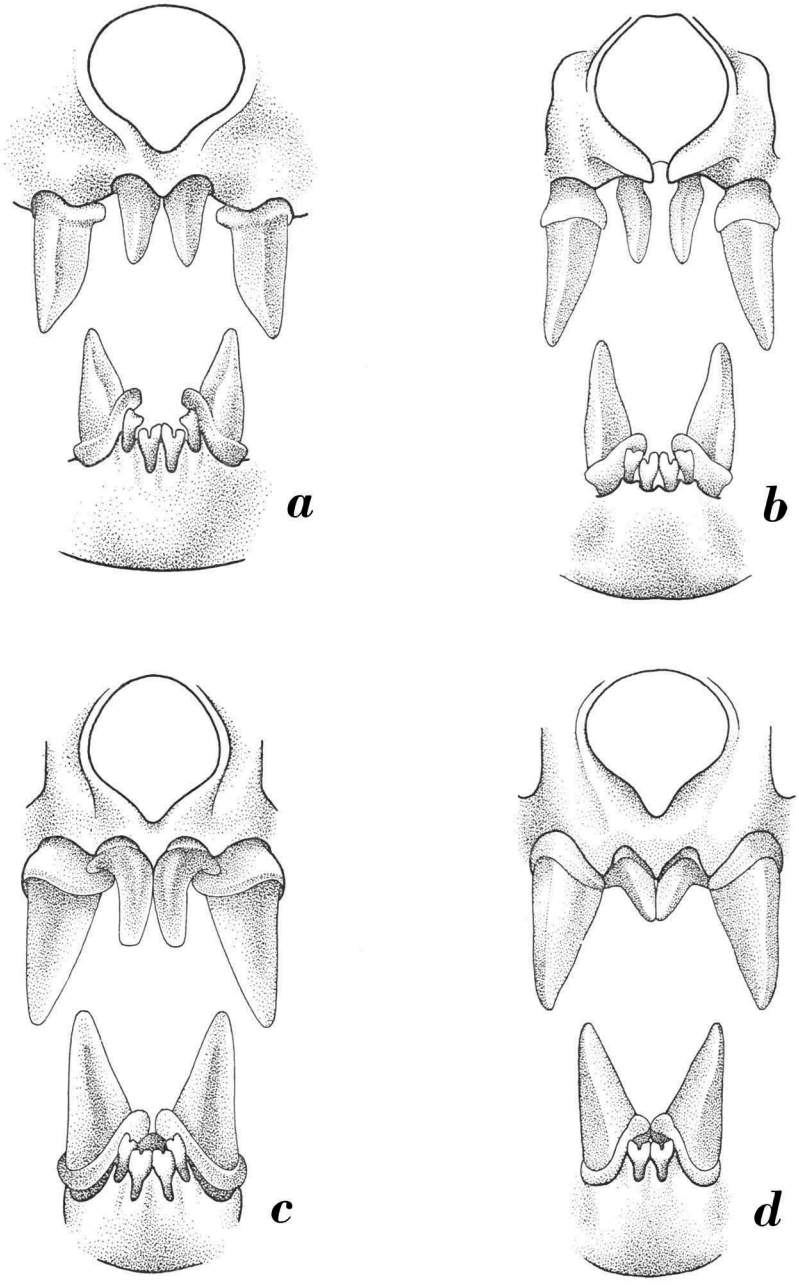

Fig. 37. Canines and incisors in front view. a, *Cynomops planirostris planirostris* (Peters), RMNH, reg. no. 12900; b, *Tadarida europs* (H. Allen), RMNH, reg. no. 15919; c, *Eumops auripendulus auripendulus* (Shaw), RMNH, reg. no. 12907; d, *Molossus ater ater* E. Geoffroy, RMNH, reg. no. 12998. Width across cingula canines in mm: a, 4.2; b, 3.7; c, 6.2; d, 5.4.

8.4 (9.0) ; lower tooth-row, c-m_3, 9.2 (9.8) ; length of mandible, 15.4 (17.0).

Remarks. — Since I did not examine the type of *Nyctinomus megalotis* from Suriname I accept upon the authority of Shamel (1931) its identity with *N. macrotis*. Hershkovitz (1949, pp. 452-453) is of the opinion that the correct name of the present species is *Tadarida molossa* (Pallas). My arguments for the use of the specific name *macrotis* are given under the species *Molossus molossus* (Pallas).

Eumops glaucinus (Wagner)

Dysopes glaucinus Wagner, 1843, Arch. Naturgesch.. vol. 9, pt. 1, p. 368.
Molossus glaucinus, Dobson, 1876, Proc. Zool. Soc. London 1876, pp. 714-715; figs. 1 and 2.

Type locality. — "Cuyaba", Matto Grosso, Brazil. In his revision of the genus *Eumops,* Sanborn (1932b, p. 353) doubted the correctness of the "recorded type locality, especially as the five recent expeditions to Matto Grosso have failed to find this species"; moreover, Sanborn based his doubt also on the known range of distribution of the species of which he examined specimens from Colombia and Ecuador in South America, and Cuba and Jamaica in the West Indies (see also Hall & Kelson, 1959, p. 213; map 160). However, it seems improbable that Wagner's locality is incorrect as the bats dealt with by Wagner were collected by J. Natterer in Brazil (Wagner based himself also on Natterer's own notes (see Wagner, 1847, p. 198, footnote)), while it is not known that Natterer collected mammals in neotropical regions outside Brazil. Furthermore Vieira (1942, pp. 444-445) reported two specimens of the present species from Pirajussára, São Paulo. Anyway it will be of interest to study Wagner's type material, if still extant, and to compare it with the type of *Molossus ferox* Gundlach from Cuba, which generally is accepted to be a junior synonym of *Eumops glaucinus.*

Distribution. — See under: Type locality.

Specimens examined. — None.

Description. — Wagner's (1843) short original description in latin is followed by a more extensive account (Wagner, 1847, pp. 197-198; pl. iv fig. 1: animal, ventral view); Dobson (1876, pp. 714-715; figs. 1 and 2: head; 1878, pp. 417-419) ; Sanborn (1932b, p. 353).

The most striking characters distinguishing the species from other *Eumops* species have been mentioned in the key on page 231.

Remarks. — *Eumops glaucinus* has been reported from Suriname by Dobson (1876, p. 715; 1878, p. 418), though this author himself did not state clearly that he examined Suriname material. Therefore I turned to

Mr. J. E. Hill of the Mammal Section of the British Museum for information as to whether or not specimens from Suriname actually are present in the collections of the British Museum. Mr. Hill kindly informed me in a letter dated May 21, 1962: "I have made a check of our collections and find that they contain no specimens of *Eumops glaucinus* from Surinam on which Dobson could have based his record. It seems to me that he has either obtained it from the literature or it is a slip of the pen, made in the Proc. zool. Soc. Lond. for 1876 and later copied in 1878". In the literature consulted by me I did not find any such record, so that the occurrence of the species in Suriname is still doubtful.

Judging from the descriptions given by Dobson (1876) and Sanborn (1932b), *Eumops glaucinus* shows a close resemblance to *E. auripendulus,* but in the former species the tragus is broad and square across the top, while also, according to Dobson, the small first upper premolar is located in the centre of the space between the canine and the second premolar. In all specimens of *E. auripendulus* examined by me the tragus is small and pointed, while the first upper premolar is crowded out of the tooth-row, so that the canine and the large second premolar are in contact with each other. The two species differ also in the coat colour, *E. glaucinus* being much lighter than *E. auripendulus.* According to Dobson (1876, p. 715) the fur of *E. glaucinus* is "above, light brown at the base of the hairs, then chestnut-brown, the extreme tips greyish, so that the upper surface appears altogether grey; beneath similarly coloured but much paler". In the specimens of *E. auripendulus* seen by me the upper parts are blackish brown while the under parts are a shade lighter dark brown.

Eumops auripendulus auripendulus (Shaw)

(figs. 36b, 37c; pl. XXVIII)

Vespertilio Auripendulus Shaw, 1800, General Zoology, Mammalia, vol. 1, pt. 1, p. 137.

Vespertilio molossus, Lammens, 1844, Isis 1844, p. 109 (non *Vespertilio molossus* Pallas).

Dysopes abrasus, Kappler, 1881, Holländisch-Guiana, p. 163 (non *Molossus abrasus* Temminck).

Molossus abrasus, Kappler, 1881, Holländisch-Guiana, p. 164.

Molossus rufus (p.p.), Jentink, 1887, Mus. Hist. Nat. Pays-Bas, vol. 9, p. 288 (non *Molossus rufus* auctorum).

Molossus abrasus, Jentink, 1887, Mus. Hist. Nat. Pays-Bas, vol. 9, p. 289.

Molossus abrasus, Jentink, 1888, Mus. Hist. Nat. Pays-Bas, vol. 12, p. 201.

Eumops abrasus, Miller, 1907, Families and genera of bats, p. 257 fig. 46: skull.

Eumops abrasus milleri, Sanborn, 1932, Journ. Mammalogy, vol. 13, p. 352.

from which De Buffon (1789, pp. 294-295; pl. 75) described and figured the present species without giving it a scientific name.

Distribution. — If *Eumops auripendulus* is considered identical with *E. abrasus* auctorum (non *E. abrasus* (Temminck), see under Remarks), the range of the species extends from the southern border of the Amazons northward to southern Mexico. For the question of the geographical races see Sanborn (1932b, pp. 351-352), Cabrera (1958, p. 124), and Hall & Kelson (1959, pp. 211-212; map 157).

Specimens examined.

Marowijne River; 1877, C. Schneider; RMNH, reg. no. 12904: female, skeleton and damaged skull (= Jentink's 1887 *Molossus abrasus,* no. a).

Paramaribo; 1888, J. H. Spitzly; RMNH, reg. no. 12906: male, preserved in alcohol, skull extracted (= Jentink's 1888 *Molossus abrasus,* no. c).

Paramaribo; 1900, H. van Cappelle; RMNH, reg. no. 12909: male, preserved in alcohol, skull extracted.

Summit of Mt. Hendrik, interior of Suriname; 1922, Expedition to Mt. Hendrik; ZMA, no. 1524a: male, preserved in alcohol, skull extracted.

Paramaribo; September, 1926, Périn; ZMA, no. 1630: male, preserved in alcohol, skull extracted.

Paramaribo; January 26, 1938, I. T. Sanderson; BMNH, no. 52.1082: female, preserved in alcohol, skull inside.

Paramaribo; date unknown, D. C. Geijskes; RMNH, reg. nos. 12907 and 12908: male and female, respectively, preserved in alcohol, skulls extracted.

Welgedacht C, south of Paramaribo; May 17, 1955, C. F. A. Bruijning; RMNH, reg. no. 12967: male, dried skin and damaged skull. — June 4, 1955, C. F. A. Bruijning; RMNH, reg. no. 12912: male, dried skin, damaged skull.

Slootwijk, Commewijne District; August 1, 1955, C. F. A. Bruijning; RMNH, reg. no. 12911: female, dried skin, damaged skull.

Suriname; between 1824 and 1836, H. H. Dieperink; RMNH, reg. no. 13011: female, damaged skull only (= Jentink's 1887 *Molossus rufus,* no. e).

Suriname; 1851, A. Kappler; SMN, Nr. 440-528: male and female, preserved in alcohol, skulls extracted.

Description. — Since 1876, when Dobson published his important paper, all authors erroneously identified the present *Eumops* species from the Guianas with *Dysopes abrasus* Temminck. As shown by their descriptions, the specimens which they brought to *Eumops abrasus* actually belong to *E. auripendulus.* Dobson (1876, pp. 712-713; 1878, pp. 415-416; pl. xxi fig. 3: head); Miller (1907a, pp. 257-258; fig. 46: skull); Sanborn (1932b, pp. 351-352); Goodwin (1960).

Length of forearm varying from 56 to 63 mm; upper lip without deep vertical grooves or wrinkles; ears large, broad, rounded, when laid forward not reaching the extreme tip of the muzzle; the inner margins of the ears arising from one point on the forehead, united at their bases only; tragus small, linear, subacutely pointed, about 1 mm long and 2 mm high, with a broad base; antitragus about twice as long as high, half-cordate or half-

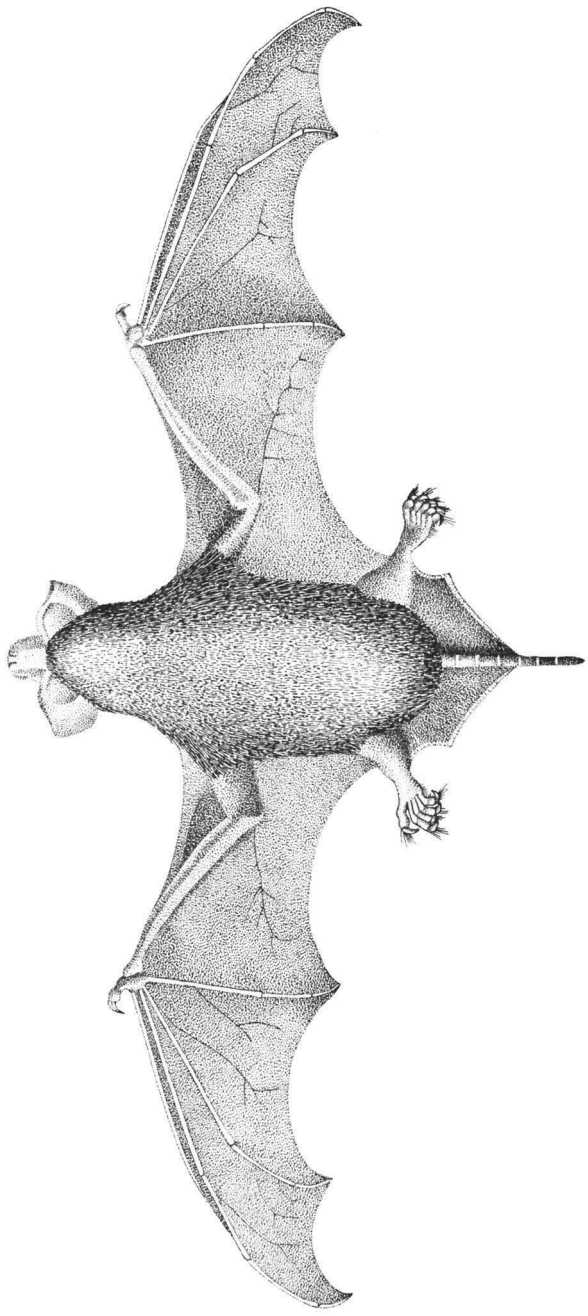

Fig. 38. *Dysopes abrasus* [=*Cynomops abrasus* (Temminck)]. After Temminck, 1826, pl. 21. 2/3 × original size.

oval, about 8 mm long and 4 mm high; wing membranes from the ankles; upper parts dark reddish brown to dark blackish brown, basal parts of the hairs buffy white; under parts somewhat paler, the sides more greyish; ears and membranes blackish.

Dental formula: $\frac{1.1.2.3}{2.1.2.3}$. Upper incisors in contact with the canines and with each other at their bases, their inner margins diverging; they are about half as high as the canines; the minute anterior upper premolar is crowded out of the tooth-row, so that the canine and the large second premolar are in contact; the second upper premolar is higher than the molars. Lower incisors subequal, bifid, and considerably shorter than the cingulum of the canines, crowded in a nearly semicircular row; the lower premolars are about equal in size, the anterior with a somewhat lower shaft than the posterior, the latter slightly lower than the first molar; the sagittal crest is distinct and well developed.

The external and skull measurements of eight specimens from Suriname are given in Table XXIX.

Remarks. — Recently Goodwin (1960) determined the true systematic status of the bat named by Shaw (1800, p. 137) *Vespertilio Auripendulus,* which proves to be the species which is usually indicated with the name *Dysopes abrasus* Temminck. Goodwin's arguments are very convincing and therefore Shaw's name is used here for this Guiana form of *Eumops,* which is characterised by having the length of the forearm about 60 mm, and the tragus minute, linear, and subacutely pointed.

Lammens (1844, p. 108) mentioned only one molossid bat from Suriname, which, judging from the measurements and coat colour noted by him, agrees rather well with the present species. Lammens's diagnosis runs as follows: "Nr. 370. Die hundsmäulige Fledermaus, Zimmermann p. 497.; *Vespertilio molossus* Erxl. — Crapaudin de la Guiane Buffon X. p. 37. t. 19., XXII. p. 119. fig. Es scheint mir, dass die auf Buffon's Tafel 19. abgebildeten Fledermäuse der Crapaudin seyen. Zimmermann beschreibt sie gut. Der Crapaudin ist über 3″ lang, die Flugweite 15, der Schwanz lang. Färbung sammetschwarz; es gibt aber auch schwärzlichbraune. Es finden sich sehr lange Haare an den Zehen der Hinterfüsse und sie ragen über die Klauen hinaus. Die Ohren sind gross und gefaltet, rund; sie vereinigen sich auf dem Kopfe, den sie fast ganz bedecken. Die Lippen gleichen denen einer Dogge; der Schwanz so lang als der Leib, steht ein Drittel über die Flughaut heraus; die zwey andern Drittel stecken in der Flughaut".

All authors, at least those publishing after 1876, considered *Dysopes abrasus,* described by Temminck (1827, pp. 232-233; pl. 21: animal, dorsal

TABLE XXIX

External and skull measurements of eight specimens of *Eumops auripendulus auripendulus* (Shaw) from Suriname.

Museum	RMNH	RMNH	RMNH	ZMA	ZMA	SMN	RMNH	SMN
Reg. number	12906	12907	12909	1630	1524a	440-528	12908	440-5 8
Sex	♂	♂	♂	♂	♂	♂	♀	♀
Forearm	59.0	60.0	60.6	59.2	60.0	60.0	57.6	62.5
Third digit, metacarpal	60	60.5	60.8	60	60.5	60.5	59	63
1st phalanx	26	26	26.5	26	27	26	25	24.5
2nd phalanx	22.5	24	24	23.5	24	25	24	25
3rd phalanx	8	9	9	8	10	9	8	8
Fourth digit, metacarpal	57	59.5	57.8	59.5	58.5	58.5	57	61
1st phalanx	21	22	20.5	22.5	22	22	20.5	23
2nd phalanx	11	11.5	12.5	11	11	12	11	12
Fifth digit, metacarpal	32	34.5	33	34	33	32.5	31.5	33.5
1st phalanx	17.5	18	17.5	18	18.5	17.5	17	19.5
2nd phalanx	9	9	8	8.5	9	10	9	10.5
Tibia	18.5	19	20	18	17.5	18.5	17	18.5
Hind foot, with claws	11.5	11	11.5	11.5	—	11.5	11	11.5
Tail, from anus	—	50	—	46	47	47	46	48
Free end of tail	22	26	25	23	25	21	25	26
Skull:								
greatest length	23.0	23.6	23.1	24.8	23.7	23.7	22.9	23.0
condylobasal length	22.1	22.6	—	22.6	22.5	22.7	21.8	22.2
condyle to front of canine	21.9	22.4	—	22.4	22.4	22.0	21.5	22.0
basal length	20.5	20.5	—	20.1	21.1	20.8	19.5	20.3
palatal length	10.4	10.5	10.7	10.4	11.2	10.8	10.3	10.4
zygomatic breadth	14.6	14.3	15.2	15.3	15.1	14.6	14.2	14.6
breadth of braincase	11.0	10.8	11.1	11.6	11.2	11.0	11.0	11.1
mastoid breadth	12.5	12.3	13.0	12.4	12.4	12.6	12.3	12.5
postorbital constriction	4.6	4.5	4.8	4.8	4.6	4.8	4.7	4.5
width across molars	10.3	10.0	10.5	10.3	10.3	10.5	9.8	10.2
width across cingula canines	6.2	6.2	6.2	6.5	6.4	6.5	5.9	6.0
upper tooth-row, c - m^3	9.8	9.7	9.6	9.8	9.9	10.0	9.5	9.6
lower tooth-row, c - m_3	11.0	10.9	10.2	10.6	10.9	10.9	10.3	10.6
length of mandible	17.2	17.8	17.5	17.7	18.0	17.2	17.2	17.5

view; see fig. 38 in the present paper; 1841, p. 356) from the interior of Brazil, to be the molossid bat dealt with here. This error was probably caused by the fact that Temminck himself considered the type of his new species to be a young specimen, and that Peters, when comparing a true *Eumops* with Temminck's type, made the mistake to consider the two identical. Dobson (1876, p. 713), namely, when dealing with *Molossus abrasus*, noted: "Prof. Peters has very kindly sent me a specimen of this species which he had determined by direct comparison with the type in the Leyden Museum. The absence of a gular sac, mentioned by Temminck, is due to the immature condition of the specimen from which the original description was taken". Temminck's type is still preserved in the Leiden Museum. The skull of this specimen was still inside when I examined it. Extraction of the skull showed

that only the rostrum and the mandible remained, as is the case in most mounted specimens of the old collections of the Leiden Museum. The specimen proves to be not immature at all but is a full-grown female with fully developed molars. The fragments of the skull show that: (a) there is a small but distinct space between the upper incisors and the canines, the former being in contact with each other at their bases, while their inner margins diverge; (b) there is one upper premolar in the tooth-row, which is in contact with the canine as well as with the first molar; (c) the lacrymal ridges are laterally well developed; (d) four lower incisors are present, the inner, which are placed before the outer, are distinctly bifid, the inner lobe is slightly higher than the outer, and much shorter than the cingulum of the canines. Externally the ears are distinctly separated on the forehead, their inner margins do not arise from one point like in most other Suriname molossid bats. The dorsal surface of the antebrachial membrane shows in the middle a patch of short reddish brown hairs; patches of similar hairs are to be observed on the dorsal surface of the wing membranes in the angle formed by the fourth and fifth metacarpals and in that formed by the fifth metacarpal and the forearm; this latter patch continues as a narrow strip along the posterior edge of the forearm up to about two-thirds of its length. The fur of the dorsal and ventral surfaces of the body consists of very short hairs, extending on the wing membranes along the sides of the body up to a line connecting the distal half of the upper arm and that of the thigh; furthermore it covers the basal third of the interfemoral membrane. The hairs of the specimen are reddish brown dorsally with the extreme bases somewhat lighter; ventrally the coat colour is more brownish, lacking the reddish tinge. The ears are broad, triangular, and rounded above; dorsally the fur extends to the middle of the ears. The rest of the ears and the membranes are naked. The antitragus is more or less quadrate with rounded upper margin, about as long as high (4 to 4.5 mm); the tragus is small, linear and subacutely pointed. The following external and skull measurements were taken: forearm, 42; length of third metacarpal, 42.5; first phalanx, 18.5; second phalanx, 15; third phalanx, 4; length of fourth metacarpal, 41; first phalanx, 15.5; second phalanx, 6; length of fifth metacarpal, 26.5; first phalanx, 10; second phalanx, 4; length of ear, about 14; width across molars, 9.2; width across cingula canines, 5.3; upper tooth-row, c-m^3, 7.4; lower tooth-row, c-m_3, 8.3; length of mandible, 14.3. The type was mentioned by Jentink (1888, p. 201) as specimen no. a of *Molossus abrasus* (= reg. no. 17374).

As shown by the above mentioned characters, the type of *Dysopes abrasus* is not, as supposed by most authors, a *Eumops,* but belongs to the genus

Molossops Peters (1865c) and should be placed in the section of that genus which was later made a separate genus *Cynomops* by Thomas (1920a, p. 189). Temminck's type agrees very well with Peters's (1865c, pp. 575-576) *Molossops brachymeles* from Peru, and is slightly smaller than the Bolivian specimen of that species mentioned by Sanborn (1932a, p. 182), of which the forearm is 43.5 mm long. Sanborn suggested that Peters's species might be identical with *M. cerastes,* originally described by Thomas (1901 g, pp. 440-441) from Paraguay; in Thomas's species the length of the forearm varies from 44 to 46 mm. *Dysopes abrasus* is much smaller than *Molossops mastivus* described by Thomas (1911b, pp. 113-114) from British Guiana, of which the forearm measures 49 mm, while the length of the tooth-row, c-m^3, is 8.8 mm. According to Cabrera (1958, pp. 118-119) *M. cerastes* and *M. mastivus* are nothing else but geographical races of *M. brachymeles.*

As pointed out on page 234 the Suriname specimens which Temminck (1841, vol. 2, p. 356) considered to be "juveniles" of his *Dysopes abrasus* actually belong to *Cynomops planirostris.* The Leiden Museum does not possess any specimens of the true *Dysopes abrasus* from Suriname.

Various authors, e.g., Peters (1865c, p. 574), Dobson (1876, p. 713; 1878, p. 416), Sanborn (1932b, p. 349), and Cabrera (1958, pp. 126-127), considered the specimen from unknown locality, probably Suriname, described by Temminck (1826, vol. 1, pp. 230-231; pl. xxiii figs. 17-19: skull) as *Molossus rufus,* to belong to *Eumops perotis* (Schinz). Temminck's type is no longer present in the Leiden Museum collection. In his catalogues Jentink (1887; 1888) also fails to mention this specimen. We must therefore assume that it has become lost between 1826 and 1887. In my opinion Temminck's description does indeed point to a species belonging to the genus *Eumops.* Though Temminck noted that his specimen is a young individual, his figures of the skull show that all molars are fully developed. In this respect it seems hardly possible that the specimen, the length of the forearm of which is 61.9 mm ("2 pouces 3 lignes"), is a young individual of *Eumops perotis,* in which the length of the forearm varies from 74 to 80 mm. In my opinion it is therefore more probable that Temminck's species is identical with *Eumops auripendulus.* The name *Molossus rufus* Temminck then falls as a junior synonym of *Vespertilio auripendulus* Shaw, 1800.

Eumops geijskesi nov. spec.

(figs. 1a, 36c; pl. XXVIII)

Molossus rufus (p.p.), Jentink, 1888, Mus. Hist. Nat. Pays-Bas, vol. 12, p. 200 (non *Molossus rufus* E. Geoffroy).

Type. — The holotype is an adult female, preserved in alcohol, skull ex-

tracted; obtained in Suriname, exact locality unknown, by W. J. Bresser in 1862; RMNH, reg. no. 12943 (= Jentink's 1888 *Molossus rufus,* no. g).

Besides the holotype there are three paratypes which belong to the same lot as the holotype; reg. no. 12945: female, dried skin and skull; reg. no. 12944: young male, dried skin and damaged skull; reg. no. 12946: juvenile male with milk dentition, preserved in alcohol, skull extracted (= Jentink's 1888 *Molossus rufus,* nos. i, h, and j, respectively).

Distribution. — So far known only from the type locality, Suriname.

Description. — The ears are large and rounded, when laid forwards they reach the smooth margin of the upper lip; the inner margins of the ears are united on the forehead for an extremely short distance only. The tragus is small, linear, and rounded above, with a broad base: the height of the tragus is about 2 mm, in the middle it is somewhat more than 1 mm long. The half-cordate antitragus is about 7 mm long and 3 mm high.

The fur consists of very soft hairs, uniformly coloured from base to tip. On the dorsal surface the fur is of a uniform dark chocolate brown colour; anteriorly the fur extends to the forehead and the basal parts of the ears, so that about one half of the outer side of the ears is naked; laterally the fur extends on to the wing membranes up to a line connecting the proximal half of the upper arm and the knee; posteriorly the fur covers about one-third of the uropatagium.

On the ventral surface of the body the fur has exactly the same colour as on the dorsal surface; the ventral surface of the uropatagium is quite naked. In the basal part of the mesopatagium, along the sides of the body, there is a narrow longitudinal area, about 5 mm broad, covered by fur; this area is sharply set off from the fur of the body, because the hairs here are bright white to whitish in colour. This area of white fur extends between the proximal half of the upper arm and the proximal part of the thigh.

The wing membranes, attached from the ankles, are pale brownish, and slightly darker on the dorsal than on the ventral surface; except for the above mentioned narrow areas the wings are naked.

The free end of the tail is equal to or somewhat longer than the proximal part, which is enclosed in the interfemoral membrane. The calcar is about three times as long as the free border of the uropatagium, as can distinctly be observed in the alcoholic specimens. A distinct but relatively small gular sac is present in the males, this sac is rudimentary or absent (?) in the females.

Dental formula: $\frac{1.1.2.3}{2.1.2.3}$. The slender shafts of the forward projecting upper incisors are about half as high as those of the canines; the upper incisors

are in contact with each other in the middle, their tips diverge, and the bases of the incisors touch those of the canines. The small first upper premolar is crowded out of the tooth-row by the canine and the large second premolar, which are in contact. The four lower incisors are subequal, bifid, and placed close together, the two inner being placed before and slightly below the outer so that their cutting edges are below those of the outer incisors. The latter are much shorter than the cingulum of the canines. The low but sharply defined sagittal crest runs from the middle of the orbital region to the basi-occipital, where it joins the lambdoidal crest. In all other respects there is the closest resemblance to Miller's (1907a, pp. 257-258) description of the skull of the genus *Eumops*.

External and cranial measurements of the holotype (female) and the female and male paratypes, respectively. Forearm (before skinning), 52.8, 51.0, 51.9; length of third metacarpal, 53.5, 53, 48; first phalanx, 24, 23, 20; second phalanx, 20, 20, 15; third phalanx, 5.5, 7, 5; length of fourth metacarpal, 51, 49, 45; first phalanx, 20, 17.5, 15; second phalanx, 5.5, 6.5, 5; length of fifth metacarpal, 30.5, 28, 26; first phalanx, 15.5, 15, 13; second phalanx, 5, 5, 4; tibia, 17, 18.5, 18.5; hind foot with claws, 11, —, —; tail from anus, 42, 40, 40; calcar, 18, 16, 17. — Skull (holotype and adult female paratype, respectively): greatest length, 20.1, 20.1; condyle to front of canine, 18.6, 18.7; basal length, 16.7, 17.3; palatal length, 8.8, 8.6; zygomatic breadth, 12.5, 12.3; breadth of braincase, 10.3, 10.3; height of braincase, 7.2, 7.0; mastoid breadth, 10.8, 10.9; postorbital constriction, 4.1, 4.1; width across molars, 8.9, 9.0; width across cingula canines, 5.0, 4.7; upper tooth-row, c-m^3, 8.4, 8.2; lower tooth-row, c-m_3, 9.1, 9.1; length of mandible, 14.5, 14.6.

Remarks. — The present species can at once be distinguished from all other Suriname Molossidae by the above mentioned streak of white hairs on the ventral surface of the mesopatagium along the sides of the body. It shows a close resemblance to *Eumops auripendulus* but is much smaller in all its dimensions.

I take great pleasure in naming this remarkable and nice species in honour of Dr. Dirk Cornelis Geijskes, Director of the Surinaams Museum at Paramaribo, Suriname, who during the last decennia has sent extensive collections of Suriname mammals to the Leiden Museum.

Eumops trumbulli (Thomas)

(fig. 36d; pl. XXIX)

Promops Trumbulli Thomas, 1901, Ann. Mag. Nat. Hist, ser. 7, vol. 7, pp. 190-191.
Molossus perotis (p.p.), Jentink, 1888, Mus. Hist. Nat. Pays-Bas, vol. 12, p. 201.

Molossus perotis, Jablonowski, 1889, Abh. Ber. Zool. Anthrop.-Ethnogr. Mus. Dresden, vol. 7, no. 7, p. 48; pl. xi fig. 10.

Type locality. — "Para", Lower Amazons, Brazil.

Distribution. — The species has been reported from the type locality, from Peru, and from Suriname.

Specimens examined.

Paramaribo; 1888, J. H. Spitzly; RMNH, reg. no. 13063: male, preserved in alcohol, skull extracted (= Jentink's 1888 *Molossus perotis* no. b).

Suriname; 1845, A. Kappler; SMN, Nr. 293: female, preserved in alcohol, skull extracted.

Suriname; 1899, from the West Indian Exhibition at Haarlem, Netherlands; ZMA, no. 1639: male, preserved in alcohol, strongly damaged skull extracted.

Description. — Thomas (1901b, pp. 190-191); Miller (1907a, pp. 257-258); Sanborn (1932b, pp. 350-351; 1949b, pp. 283-284).

Length of forearm varying from 70 to 73 mm; upper lip without deep vertical grooves or wrinkles; ears large and broad, rounded, inner margins united by their bases only; tragus small, quadrate, superior margin about 3 mm, height about 4.5 mm; antitragus about twice as long as high, about 11.5 mm long and 5.5 mm high; wing membrane from the distal part of the tibia near the ankle. In the original description Thomas described the coat colour as follows: "General colour above more "hair-brown" than the rufous-brown of *P. perotis.* Under surface whitish brown, paler along the middle line; the long hairs on the throat whitish grey; face and chin blackish brown".

Dental formula: $\frac{1.1.2.3}{2.1.2.3}$. Upper incisors large, completely filling the space between the canines, in contact with the canines as well as with each other except at the diverging tips; the canine with a distinct notch at the centre of the inner basal cingulum, visible in the buccal aspect of the teeth; first upper premolar small, scarcely exceeding the cingulum of the large second premolar, slightly crowded out of the tooth-row; the canine and the second premolar do not touch. Lower incisors subequal, bifid, much shorter than the cingulum of the canines, crowded in a nearly semicircular row; lower premolars about equal in size, the anterior with somewhat lower shaft than the posterior.

External and skull measurements of the examined specimens of the Leiden, Amsterdam, and Stuttgart Museums, respectively; in parentheses some skull measurements of *Eumops perotis* (Schinz) are given, based on a strongly damaged skull from Concepcion, Argentina (BMNH, no. 26.1.9.6: male). Forearm, 71.5, 73.0, 70.5; length of third metacarpal, 72, 73, 71.5; first

phalanx, 30, 29, 27; second phalanx, 25, 27, 26; third phalanx, 9, 9, 7; length of fourth metacarpal, 71.5, 72, 69.5; first phalanx, 24, 23, 22.5; second phalanx, 11, 13, 10.5; length of fifth metacarpal, 40.5, 40.5, 38.5; first phalanx, 21, 21.5, 20; second phalanx, 10, 12, 11.5; tibia, 21, 22, 21; hind foot, 14, 14, 14; tail, from anus, 56, 54, 55. — Skull: greatest length, 27.3, —, 26.6; condylobasal length, 26.3, —, 25.6; condyle to front of canine, 26.2, —, 25.3; basal length, 23.4, —, 23.0; palatal length, 12.1, —, 11.4; breadth of braincase, 12.4, —, 12.2; postorbital constriction, 5.0, —, 4.9; width across molars, 11.6, —, 11.1; width across cingula canines, 6.6, —, 6.5 (8.3); upper tooth-row, c-m^3, 11.4, —, 11.1 (12.7); large premolar and first two molars, combined length, 6.9, —, 6.8 (8.1); lower tooth-row, c-m_3, 12.0, 12.3, 11.7 (13.7); first lower premolar, transverse diameter, 1.6, 1.5 1.5 (1.9); first lower molar, transverse diameter, 1.9, 2.0, 1.8 (2.2); length of mandible, 20.3, 21.0, 19.6 (22.9).

Remarks. — The present species is closely related to *Eumops perotis* (Schinz) but the differences between the two forms justify their specific separation. Though Sanborn (1932b, p. 350) at first gave *E. trumbulli* only subspecific rank, he assigned full specific status to it in a later paper (Sanborn, 1949b, p. 283). The main differences between the two species are: (1) *E. trumbulli* is smaller than *E. perotis,* the length of the forearm of the former varies, as far as known, from 70 to 73 mm, while in *E. perotis* these figures are 74 to 80 mm; (2) the teeth of *E. trumbulli* are considerably smaller than those of *E. perotis,* as is clearly shown by the measurements given by Thomas (1901b) and by Sanborn (1949b); (3) in *E. trumbulli* the cingulum of the canine shows a distinct notch on the inner side, while such a notch is not present in *E. perotis.* When comparing the skull measurements given by Sanborn for an adult male and female from Yarinacocha, Peru, with those of the type specimen and the present Suriname material, it appears that the Peruvian form is somewhat larger than that of the Parà and Suriname regions; there is, however, a considerable difference in size between Peruvian specimens of *E. trumbulli* and *E. perotis,* as is shown by a comparison of the measurements of the two species as given by Sanborn (1932b, pp. 349-351). With the material at hand it is not possible to decide the question whether or not two subspecies should be distinguished in *E. trumbulli.*

The Stuttgart specimen has been examined by Jablonowski (1899, p. 48, pl. xl fig. 10: head, front view) in his study on the structure of the hairs of molossid bats.

Molossus molossus (Pallas)

(fig. 39c; pl. XXIX)

V. (espertilio) Molossus (p.p.) Pallas, 1766, Miscellanea zoologica, pp. 49-50.

Dysopes obsculus, Temminck, 1826, Monographies de Mammalogie, vol. 1, pp. 230-237, pl. 22 fig. 2 (animal), pl. 23 figs. 20-21 (skull). Misprint for *D. obscurus.*

Molossus rufus, var. α (*Molossus obscurus*), Dobson, 1878, Catalogue Chiroptera British Museum, p. 413.

Molossus obscurus, Kappler, 1881, Holländisch-Guiana, p. 164.

Molossus obscurus, Jentink, 1887, Mus. Hist. Nat. Pays-Bas, vol. 9, pp. 288-289; 1888, vol. 12, pp. 200-201.

Molossus rufus (p.p.), Jentink, 1888, Mus. Hist. Nat. Pays-Bas, vol. 12, p. 200.

Molossus rufus obscurus, Jablonowski, 1899, Abh. Ber. Zool. Anthrop.-Ethnogr. Mus. Dresden, vol. 7, no. 7, p. 47, pl. 11 fig. 8 (head).

Molossus spec., Sanderson, 1939, Caribbean Treasure, pp. 221-222.

Type locality. — Martinique, W.I. See also under Remarks.

Distribution. — The present species has a wide distribution in Central and South America, including the West Indies.

Specimens examined.

Suriname; between 1824 and 1836, H. H. Dieperink; RMNH, reg. nos. 12951 and 12952: damaged skulls only (= Jentink's 1887 *M. obscurus,* nos. d and e).

Suriname; between 1824 and 1836, H. H. Dieperink; RMNH, reg. nos. 12954 and 12955: two skeletons only (= Jentink's 1887 *M. obscurus,* nos. b and c).

Suriname; between 1824 and 1836, H. H. Dieperink; RMNH, reg. no. 12947: female, dried skin, skull extracted (= Jentink's 1888 and 1887 *M. obscurus,* nos. f and a, respectively).

Suriname; between 1824 and 1836, H. H. Dieperink; RMNH, reg. nos. 12948-12950: three males, dried skins, skulls inside (= Jentink's 1888 *M. obscurus,* nos. b, c, and d).

Suriname; between 1824 and 1836, H. H. Dieperink; RMNH, reg. no. 13004: male, preserved in alcohol, skull extracted (= Jentink's 1888 *M. obscurus,* no. g).

Suriname; 1844, A. Kappler; SMN, Nr. 264/575, 1-2: two females, preserved in alcohol, skulls extracted; Nr. 264/575, 3: male, preserved in alcohol, skull extracted.

Suriname; 1877, A. Kappler; SMN, Nr. 1632: female, preserved in alcohol, skull extracted.

Marowijne River, Suriname; 1877, C. Schneider; RMNH, reg. no. 12953: male, skeleton only (= Jentink's 1887 *M. obscurus,* no. a).

Paramaribo; 1888, J. H. Spitzly; RMNH, reg. nos. 12939-12942: four males, preserved in alcohol, skulls extracted (= Jentink's 1888 *M. rufus,* nos. l, m, n, and o).

Upper Saramacca River, Suriname; November 4, 1902, J. de Kock; RMNH, reg. nos. 12993 and 12994: two males, preserved in alcohol, skulls extracted.

Paramaribo; December 6, 1940, D. C. Geijskes; RMNH, reg. no. 12990: male, dried skin and skull.

Americankondre, Marowijne River; February 11, 1949, Suriname Expedition 1948/1949; RMNH, reg. no. 12987: female, dried skin and skull.

Paramaribo; May 9, 1949, D. C. Geijskes; RMNH, reg. no. 12997: female, preserved in alcohol, skull extracted.

Paramaribo; August 20, 1950, D. C. Geijskes; RMNH, reg. no. 12989: female, preserved in alcohol, skull extracted.

Mason, Marowijne River; February 23, 1952, D. C. Geijskes; RMNH, reg. no. 17407: male, preserved in alcohol, skull extracted.

Jodensavanne, Suriname River, south of Paramaribo; May 1954, J. Lindeman; RMNH, reg. no. 17405: male, preserved in alcohol, skull inside.

Welgedacht C, south of Paramaribo; May 24, 1955; C. F. A. Bruijning; RMNH, reg. no. 12991: male, dried skin and skull.

Kwattaweg, west of Paramaribo; July 18, 1955, C. F. A. Bruijning; RMNH, reg. no. 12956: male, dried skin and skull.

Kwattaweg, west of Paramaribo; July 19, 1955, C. F. A. Bruijning; RMNH, reg. nos. 12957-12960: four males, dried skins and skulls; reg. nos. 12971-12975: five females, dried skins and skulls.

Kwattaweg, west of Paramaribo; July 20, 1955, C. F. A. Bruijning; RMNH, reg. nos. 12963 and 12976: male and female, respectively, dried skins and skulls.

Kwattaweg, west of Paramaribo; July 21, 1955, C. F. A. Bruijning; RMNH, reg. nos. 12964-12966: three males, dried skins and skulls; reg. nos. 12981 and 12984: two females, dried skins and skulls.

Bosbivak, Zanderij, south of Paramaribo; April 23, 1956, J. van der Kamp; ZMA, no. A 1883: female, preserved in alcohol, skull extracted.

Republiek, south of Paramaribo; December 12, 1956, D. C. Geijskes; RMNH, reg. nos. 17413-17414: two males, preserved in alcohol, skulls inside.

Combé, Paramaribo; May 3, 1957; D. C. Geijskes; RMNH, reg. no. 17412: female, preserved in alcohol, skull inside.

Zorg en Hoop, Paramaribo; May 17, 1960, J. Belle; RMNH, reg. no. 17404: male, preserved in alcohol, skull inside.

Zanderij, south of Paramaribo; April 21, 1961, D. C. Geijskes; RMNH, reg. no. 17373: male, preserved in alcohol, skull inside.

Paramaribo; May 26, 1961, D. C. Geijskes; RMNH, reg. no. 17403: male, preserved in alcohol, skull inside.

Garnizoenspad, Paramaribo; August 26, 1961, D. C. Geijskes; RMNH, reg. nos. 17415-17419: five males, preserved in alcohol, skulls inside.

Tempati, Tempati Creek, Commewijne River basin; August 28, 1961, K. H. Voous; ZMA, no. 4471: one male and three females, preserved in alcohol, skulls inside.

Description. — Temminck (1826, vol. 1, pp. 236-237; pl. 22 fig. 2: animal, ventral view; pl. 23 figs. 20-21: skull); Dobson (1876, pp. 710-711; 1878, pp. 412-413); Miller (1907a, pp. 260-261; 1913a, p. 91); Husson (1960, pp. 80-82; fig. 20: head, left side view; pl. 23: skull); Goodwin & Greenhall (1961, pp. 288-289: *M. major major*; pl. 34 figs. 7-9: skull). Temminck, Dobson, and Miller used the name *Molossus obscurus* for the present species.

Length of forearm varying from about 37 to 40.5 mm; muzzle short, truncated; ears short and broad, arising from a single point on the forehead, from which furthermore a well defined ridge extends forwards to the nostrils; tragus minute, linear, acutely pointed; antitragus more or less circular, about as wide as high; interfemoral membrane moderately developed, when stretched extending behind the relatively short hind feet; tibia relatively short; tail thick, enclosed in the interfemoral membrane, projecting for about half its length behind the posterior margin of the membrane; wings from the ankles; gular sac distinct in the males, small or rudimentary in the females. The fur is short and velvety. On the dorsal surface of the wing

membrane it extends as far as a line connecting the basal third of the upper arm with the knee. Furthermore the dorsal surface of the wing membrane shows the following furred patches: (a) a band on the antebrachial

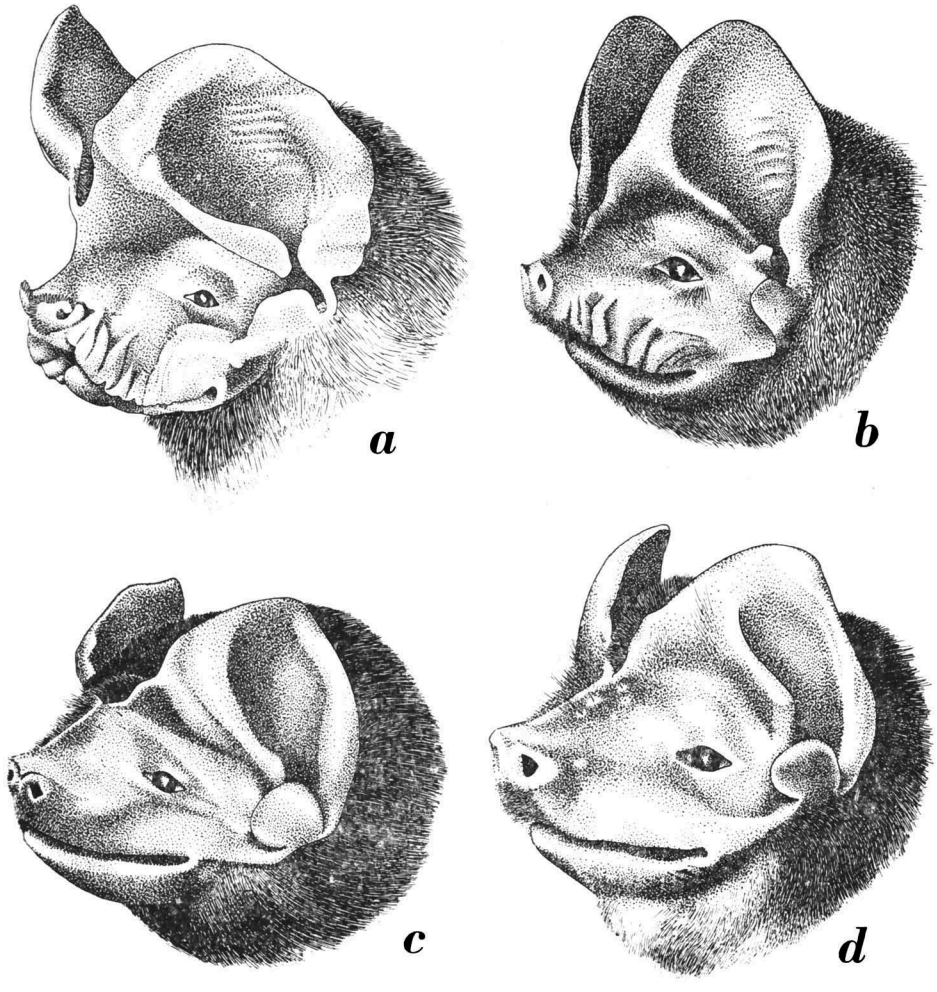

Fig. 39. a, *Tadarida macrotis* (Gray), BMNH, no. 9.1.4.52; b, *Tadarida europs* (H. Allen), RMNH, reg. no. 15920; c, *Molossus molossus* (Pallas), RMNH, reg. no. 17373; d, *Molossus ater atcr* E. Geoffroy, RMNH, reg. no. 13000.

membrane extending along the forearm, (b) a much less distinct band behind the forearm on the wing membrane, (c) a spot in the angle between the fourth and fifth metacarpals. On the ventral surface of the wing mem-

brane the fur extends as far as a line connecting the elbow with the knee; loosely haired patches or bands are furthermore present along the forearm and the fifth metacarpal. On the basal third of its ventral surface the interfemoral membrane is also provided with fur. Dorsally the toes bear long curved hairs. The colour is variable, on the dorsal surface of the body it varies from dark brown to dark greyish brown, on the ventral surface it is paler; the area around the gular sac is whitish. The dorsal surface has a mottled appearance caused by the fact that the basal part of the hairs is whitish or light yellowish brown, while the tips are dark or dark greyish brown. On the ventral surface the basal parts of the hairs are whitish followed by a broad brownish band, while the extreme tips are yellowish. The wings are blackish brown above, somewhat paler below.

Dental formula: $\frac{1.1.1.3}{1.1.2.3}$. Upper incisors completely filling the space between the canines, touching each other and the cingulum of the canine; their height about one-third that of the canines. The upper premolar is nearly as broad as the first molar, its crown area being more than half the size of that of the first molar; externally its shaft is about twice as high as that of the molars. The lower incisors are distinctly bifid, they are much shorter than the cingulum of the canines, which on their inner sides touch or almost touch each other; the first lower premolar is in contact with both the canine and the second premolar, it is much smaller than and about half as high as the second premolar, the latter being about as high as the lower molars. The knife-like sagittal crest, extending from the base of the nasals to the lambdoidal crest, is better developed in the males than in the females; in the examined Suriname specimens the height of the sagittal crest varies in the males from 0.8 to 1 mm, in the females from 0.4 to 0.7 mm.

External and skull measurements of ten Suriname specimens are given in Table XXX.

Remarks. — *Molossus molossus* belongs together with *Molossus ater ater, Glossophaga soricina soricina,* and *Carollia perspicillata perspicillata,* to the most common bats of Suriname. Judging by the collectors' notes of my material the species are usually found inside houses, sheds, and stables, under bridges and culverts, and in tunnels, and often are a serious nuisance. Wherever in popular publications on Suriname bat life the animals are described as a pest, it is probable that one or more of the above species are meant.

Sanderson (1939, p. 221) gave a vivid account of "Molossus" observed by him in the neighbourhood of Republiek, south of Paramaribo. Unfortunately no specific name is given so that it is possible that he actually observed

TABLE XXX

External and skull measurements of ten specimens of *Molossus molossus* (Pallas) from Suriname.

Museum		ZMH	RMNH	RMNH	RMNH	RMNH	SMN	SMN	SMN	RMNH	RMNH
Reg. number		38862a	12956	12963	12993	12994	1632	264-575,1	264-575,2	12975	12988
Sex		♂	♂	♂	♂	♂	♀	♀	♀	♀	♀
Forearm		39.1	40.3	40.0	40.5	40.0	39.8	37.8	39.8	38.9	40.5
Third digit,	metacarpal	41.5	40	40.5	41.5	41.5	41	39	42.5	39	41.5
	1st phalanx	18.5	18	18	19	18	18.5	17	18	19	19
	2nd phalanx	16	15	16	16.5	16	15.5	13.5	15	16	16
	3rd phalanx	3	2	4.5	3.5	3	3.5	3	3	3.5	4
Fourth digit,	metacarpal	41.5	39	39.5	41	40	40	38	41	38	41.5
	1st phalanx	15.5	15	15	16	15.5	15.5	14	15.5	16	16
	2nd phalanx	3.5	3.5	4.5	6	5	4.5	3.5	4.5	3	3
Fifth digit,	metacarpal	26	25	25	26	26.5	26	25.5	26.5	26	26
	1st phalanx	9.5	10	10	10	11	10	10	10	11	10.5
	2nd phalanx	6	5.5	6	6	6	6	5.5	6	4	6.5
Tibia		13	—	—	14	15	13	14	13	15	14
Hind foot		8	—	—	9	9	8.5	8	8	8.5	8
Tail		35.5	35	38	38	40	36	36	35	36	36.5
Skull:											
greatest length		17.0	17.2	17.4	17.3	17.5	16.8	16.1	16.5	16.9	16.8
condylobasal length		15.5	15.7	15.9	15.7	16.2	15.4	14.8	15.2	15.6	15.4
condyle to front of canine		15.5	15.6	15.8	15.7	16.1	15.4	14.7	15.2	15.4	15.4
basal length		13.7	14.0	13.9	14.0	14.3	13.5	12.8	13.2	13.5	13.5
palatal length		6.0	6.2	6.1	6.1	6.3	5.9	5.7	5.8	6.2	6.0
zygomatic breadth		11.0	11.1	11.2	11.2	11.3	10.6	—	—	10.5	10.6
breadth of braincase		9.0	9.2	9.0	9.1	9.1	8.7	8.7	8.7	8.8	8.8
height of braincase, without crest		6.6	6.7	6.2	6.5	6.3	6.3	6.2	6.3	6.2	6.3
mastoid breadth		10.7	10.4	10.8	10.9	10.8	10.2	9.6	10.4	10.1	10.3
interorbital constriction		3.7	3.8	3.7	3.7	3.7	3.4	3.1	3.3	3.6	3.5
width across molars		7.6	8.0	7.9	8.1	8.1	7.5	7.2	7.4	7.5	7.6
width across cingula canines		4.8	4.6	4.5	4.5	4.6	4.5	3.9	4.1	4.1	4.2
upper tooth-row, c - m^3		6.3	6.4	6.2	6.3	6.4	6.3	5.9	6.1	6.2	6.1
lower tooth-row, c - m_3		7.2	7.0	6.9	7.1	7.3	7.0	6.5	6.8	6.9	6.9
length of mandible		11.4	11.9	11.9	12.0	12.0	11.7	11.0	11.4	11.4	11.6

M. ater ater. His interesting observations are cited here in full: "Secondly there were a great number of a species belonging to the genus Molussus. These are friendly, eager little creatures with grotesquely crumpled ears, beady black eyes, and long ratlike tails. The body is heavy and dense and the wings small, very slender, and pointed. Usually they are timid creatures, like all bats, but at this place they behaved in an extraordinary manner. They would fly in and land on the dinner table, on our chairs, on the floor, even on our persons. They seemed to be quite fearless so that one could poke them and even handle them; all they did was to snap back at our fingers, like tiny angry dogs, and run about with the agility of mice, using their folded wings as forelegs. Desmodus is not the only bat that walks about like an ordinary animals. These Molussus can run along the floor and take off like a bird from a smooth level surface, and I honestly believe they are happier on the ground than in the air". This manner of walking is known for *Molossus* since long; Dobson (1878, p. 412), referring to observations on Jamaica specimens published by Gosse in 1851, noted: "Mr. Gosse remarks that it is more active on the ground than any other species. On the least touch it ran, or rather crawled, about with such agility that it was not easy to seize it. When running it rests on the wrists, elevating the front of the body considerably". A most important paper on the biology and the control of Trinidad *Molossus molossus* has recently been published by Greenhall & Stell (1960).

The examined series of Suriname *Molossus molossus* shows that animals that are in possession of the permanent dentition usually have a forearm length of 37 or over 37 mm, but a few exceptions do occur; the mean value of the forearm length in such specimens is about 39 mm; no significant difference between males and females was found by me in this measurement.

Concerning the name of the present species there is considerable confusion in the literature.

The description of *Vespertilio Molossus* by Pallas (1766, pp. 49-50) was based on two sets containing at least three specimens: (1) one (or perhaps more) from "America" examined by Pallas himself, and (2) the larger and smaller specimen figured by Daubenton in De Buffon & Daubenton (1763, ed. 1, vol. 10, pp. 84-88, pl. xix). In a later publication (1767, p. 8, pl. 4 fig. 11), Pallas not only gave a more extensive description of his material, but also figured the skull. His figure clearly shows that the specimen belongs to the genus *Tadarida*; according to Miller (1913a, p. 86, footnote 4) Pallas's specimen is the mainland form of *Tadarida macrotis* (Gray, 1839). The larger of Daubenton's specimens (1763, pl. xix fig. 1) is the type specimen both of *Vespertilio molossus major* Kerr, 1792, and of *Molossus fusciventer* E. Geoffroy, 1805, while the smaller (pl. xix fig. 2) is the type both of

Vespertilio molossus minor Kerr, 1792, and of *Molossus longicaudatus* E. Geoffroy, 1805. According to Miller (1913a, p. 85) Daubenton's two specimens belong to one single species, which he (Miller) named *Molossus major* Kerr, 1792. Kerr (1792, p. 97) stated that his species inhabits the West Indian islands. Daubenton (1763, p. 87, footnote) remarked that his "autre chauve-souris", the one shown on pl. xix fig. 1, has been named by him "mulot-volant", the description of which was published "dans les Mémoires de l'Académie royale des Sciences, année 1759". Miller (1913a, p. 85, footnote 2) found that this part of the "Mémoires" was published in 1765, and that on page 387 of the publication the statement occurs that the "mulot-volant" originated from Martinique. I myself consulted "Histoire de l'Académie royale des Sciences. Année 1759. Avec les Mémoires de physique, pour la même Année. Tirés des registres de cette Académie. Tome troisième", which was published in 1777. In this publication Daubenton's article "Mémoire sur les chauve-souris" is to be found on pages 87-133, the "mulot-volant" being dealt with on pages 111-112. On page 112 Daubenton notes: "Cette chauve-souris se trouve à la Martinique". Thus the type locality for *Molossus major* Kerr, 1792, is Martinique, W.I.

Vespertilio molossus Pallas, 1766, thus is a composite species, based on at least one specimen of *Tadarida macrotis* (Gray, 1839) from "America", and two specimens of *Molossus major* Kerr, 1792, one of which originates from Martinique, the other from an unknown locality.

As far as known to me no lectotype has ever been selected for Pallas's species. In order to prevent further confusion I select here as the lectotype of *Vespertilio Molossus* Pallas, 1766, the larger of the two specimens figured by Daubenton (in De Buffon & Daubenton, 1763, pl. xix fig. 1). In this way both *Vespertilio molossus major* Kerr, 1792, and *Molossus fusciventer* E. Geoffroy, 1805, become objective synonyms of *Vespertilio Molossus* Pallas, 1766. Consequently, the species named *Molossus major* by Miller (1913a, p. 90) has to bear the name *Molossus molossus* (Pallas, 1766).

If the above course were not adopted and Pallas's specimen from "America" (see Pallas, 1767, pl. 4 fig. 11) were selected the type of *Vespertilio Molossus,* the specific name *macrotis* Gray, 1839 (as first published in the binomen *Nyctinomus macrotis*) would become a synonym of *molossus* Pallas. Miller (1913a, p. 86, footnote 4) and Hershkovitz (1949, p. 452) have actually made this substitution (without, however, selecting a lectotype for Pallas's species). Both these authors, however, have disregarded the additional consequences of such a type selection. The type species of the genus *Molossus* E. Geoffroy, 1805, according to Miller (1913, p. 86) is *Vespertilio molossus* of authors and not *V. molossus* Pallas "since Geoffroy makes no direct re-

ference to Pallas in connection with this (generic) name". This is not true, since Geoffroy (1805b, p. 152, 153) on several occasions refers to Pallas's species, which therefore becomes the type species of the genus *Molossus* by absolute tautonymy. It is impossible to use the generic name *Molossus* for a genus not containing the species *Vespertilio molossus* Pallas. The present type selection of Daubenton's larger specimen as the type of *Vespertilio molossus* Pallas is the best way out of the complicated situation.

In his original description of *Molossus obscurus,* Geoffroy (1805a, p. 279) did not give the locality of origin of the material examined by him, and only stated that he thought this species to be the same as D'Azara's "petite chauve-souris obscure" from Paraguay. Later on, Temminck (1826, p. 236-237, pl. xxii fig. 2) gave a more extensive description and a figure of the species based on material from Suriname. This induced many authors to consider Suriname the type locality of *M. obscurus.* However, Rode (1941, p. 96; see also Hershkovitz, 1951, p. 558-559) showed that Geoffroy's holotype originated from the Antilles, so that the name *obscurus,* like the name *molossus,* is based on material from the West Indies, and neither can be used as the name of the mainland form if the *Molossus molossus* from the West Indian islands should prove to be subspecifically distinct from *M. molossus* of the Guianas. In order to definitely settle this question, I here further restrict the type locality of *M. obscurus* E. Geoffroy to Martinique.

The following synonymies of *Molossus molossus* (Pallas) and *Tadarida macrotis* (Gray), summarize the status of the various names used in the above discussion.

Molossus molossus (Pallas)

"Autre chauve-souris", Daubenton, 1763, in De Buffon & Daubenton, Histoire Naturelle, ed. 1, vol. 10, pp. 84-87, pl. xix fig. 1.

"Mulot-volant", Daubenton, 1765, Mém. Acad. royale des Sci. Paris, année 1759, p. 38.

V. (espertilio) Molossus (p.p.) Pallas, 1766, Miscellanea zoologica, pp. 49-50.

Vespertilio Molossus (p.p.) Pallas, 1767, Spicilegia zoologica, vol. 1, fasc. 3, p. 8.

Vespertilio molossus major Kerr, 1792, Animal Kingdom, p. 97.

Vespertilio molossus minor Kerr, 1792, Animal Kingdom, p. 97.

Molossus obscurus E. Geoffroy, 1805, Bull. Sci. Soc. Philom. Paris, vol. 3, no. 96, p. 279 (error for p. 379).

Molossus longicaudatus E. Geoffroy, 1805, ibidem.

Molossus fusciventer E. Geoffroy, 1805, ibidem.

Molossus major, Miller, 1913, Proc. U. S. Nat. Mus., vol. 46, p. 90.

Type locality. Martinique, W.I.

Tadarida macrotis (Gray)

V. (espertilio) Molossus (p.p.) Pallas, 1766, Miscellanea zoologica, pp. 49-50.

Vespertilio Molossus (p.p.) Pallas, 1767, Spicilegia zoologica, vol. 1, fasc. 3, p. 8, pl. 4 fig. 11 (skull).

Nyctinomus macrotis Gray, 1839, Ann. Nat. Hist., vol. 4, p. 5, pl. 1 fig. 3.
Nyctinomus molossus, Miller, 1913, Proc. U. S. Nat. Mus., vol. 46, p. 86, footnote 4.
Tadarida molossa, Hershkovitz, 1949, Proc. U. S. Nat. Mus., vol. 99, p. 453.
Type locality. Cuba, W.I.

As Hershkovitz (1949, p. 453-454) points out, it is impossible to maintain as distinct species most of the forms described in the present genus. Whether the present Suriname specimens are subspecifically distinct from the typical *Molossus molossus* from Martinique remains to be seen; with the scanty Antillean material at hand it is impossible for me to arrive at a definite conclusion in this respect. Accordingly, no subspecific term is assigned to the Suriname specimens. Should the Guiana form of *M. molossus* prove to be subspecifically distinct from the typical Antillean form, like, e.g., accepted by Cabrera (1958, p. 130), then the name *M. molossus crassicaudatus* E. Geoffroy should be used for it. The correct dates of publication of the names of the species of the genus *Molossus* described by E. Geoffroy are dealt with under *M. ater.*

It is possible that also *Molossus burnesi,* described by Thomas (1905, pp. 584-585) from Cayenne, French Guiana, occurs in Suriname. This species is much smaller than *M. molossus*; in the type, a female, the length of the forearm is 33.7 mm, the third metacarpal 35 mm, and the length of the fifth digit 33 mm.

As far as the spelling of the name *M. burnesi* is concerned we have to keep in mind that Article 32 (b) of the 1961 Code (page 35) reads: "If a name is spelled in more than one way in the original publication, the spelling adopted by the first reviser is to be accepted as the correct original spelling". In the original description (Thomas, 1905, pp. 584-585) besides *Molossus Burnesi* the name *M. Barnesi* is used. The first reviser (Miller, 1913a, pp. 87 and 91) has the spelling *burnesi,* which thereby becomes the valid original spelling, nothwithstanding the fact that obviously Thomas named the species for the collector, Mr. Barnes. Cabrera's (1958, p. 129) attempts to revive the spelling *barnesi* therefore cannot become effective.

Molossus ater ater E. Geoffroy

(figs. 37d, 39d; pl. XXX)

Molossus ater E. Geoffroy, 1805, Bull. Sci. Soc. Philom., vol. 3, no. 96, p. 279 [error pro 379]; Annales Mus. Hist. Nat. Paris, vol. 6, p. 155.
Dysopes alecto, Temminck, 1841, Monographies de Mammalogie, vol. 2, p. 355.
Molossus rufus, Dobson, 1876, Proc. Zool. Soc. London 1876, p. 710; 1878, Catalogue Chiroptera British Museum, p. 411.
Molossus rufus, Kappler, 1881, Holländisch-Guiana, p. 164.

Molossus rufus (p.p.), Jentink, 1887, Mus. Hist. Nat. Pays-Bas, vol. 9, p. 288.
Molossus rufus (p.p.), Jentink, 1888, Mus. Hist. Nat. Pays-Bas, vol. 12, p. 200.
Molossus rufus, Jablonowski, 1899, Abh. Ber. Zool. und Anthrop.-Ethnogr. Mus. Dresden, vol. 7, no. 7, p. 47.
? *Molossus* spec., Sanderson, 1939, Caribbean Treasure, pp. 221-222.

Type locality. — In the original description E. Geoffroy (1805a, p. 279 [error pro p. 379]) did not mention a locality, but in his extensive "Mémoire" on the genus *Molossus,* published in the same year (Geoffroy, 1805b, p. 154) he stated that his species of *Molossus* other than those observed by D'Azara in Paraguay, were sent to the Paris Museum "de l'Amérique du nord, de Surinam, et principalement de Caïenne". The correct status of *Molossus ater* was recently discussed by Goodwin (1960), who came to the conclusion that the species *Molossus rufus* auctorum actually is *M. ater,* and that Geoffroy's *M. rufus* is identical with *Vespertilio auripendulus* Shaw (cf. *Eumops auripendulus auripendulus,* page 243 of the present paper). Goodwin & Greenhall (1961, p. 281) restricted the type locality of *M. ater* to "Cayenne, French Guiana".

Distribution. — According to Cabrera (1958, p. 132) and Hall & Kelson (1959, p. 215; map 161) the present species (dealt with by them under the name *Molossus rufus*) has a wide range extending from southern Mexico through Central America to South America, where it occurs as far south as Paraguay and southern Brazil. The typical form has been reported from Venezuela, Trinidad, and the Guianas southward to Peru and the Matto Grosso, Brazil; its exact range of distribution, however, is insufficiently known.

Specimens examined.

Interior of Brazil; date unknown, M. von Wied-Neuwied; RMNH, reg. no. 13023: holotype of *Dysopes alecto* Temminck, dried skin and damaged skull (= Jentink's 1887 and 1888 *Molossus rufus,* nos. b and a, respectively).

Suriname; between 1824 and 1836, H. H. Dieperink; RMNH, reg. no. 13019: female, dried skin, no skull (= Jentink's 1888 *M. rufus,* no. b; according to Jentink, no. e of his 1887 Catalogue is the skull of this 1888 specimen, this skull no. e proved, however, to belong to *Eumops auripendulus*).

Suriname; between 1824 and 1836, H. H. Dieperink; RMNH, reg. nos. 13020-13022: male, female, and young animal, respectively, dried skins, skulls inside (= Jentink's 1888 *M. rufus,* nos. c, d, and e).

Paramaribo; 1888, J. H. Spitzly; RMNH, reg. no. 12938: male preserved in alcohol, skull extracted (= Jentink's 1888 *M. rufus,* no. k).

Suriname; before 1887, collector unknown; RMNH, reg. no. 13065: sex unknown, skeleton, skull damaged (= Jentink's 1887 *M. rufus,* no. a).

Paramaribo; 1899, from the West Indian Exhibition at Haarlem (the Netherlands); ZMA, no. 1636 and 1638: female and male, respectively, preserved in alcohol, skulls extracted.

Berg en Dal, Upper Suriname River, south of Paramaribo; October, 1908, C. Heller; ZMH, Nr. 38862b and c: two males preserved in alcohol, skulls extracted.

Suriname; June 9, 1910, D. G. J. Bolten; RMNH, reg. nos. 13001, and 12998-13000: one female and three males, respectively, preserved in alcohol, skulls extracted.

Peperpot, Suriname River, near Paramaribo; September 14, 1948, Suriname Expedition 1948/1949; RMNH, reg. nos. 13002 and 13003: two males, preserved in alcohol, skulls extracted.

Ma Retraite, Paramaribo; between April 22 and April 26, 1955, C. F. A. Bruijning; RMNH, reg. no. 13013: male, dried skin, damaged skull; reg. nos. 13024 and 13025: two males, preserved in alcohol, skulls inside; reg. nos. 13059-13061: three females, preserved in alcohol, skulls inside.

Hannaslust, Blijdenhoop, south of Paramaribo; May 13, 1955; C. F. A. Bruijning; RMNH, reg. nos. 13026, and 13044-13049: one male and six females, preserved in alcohol, skulls inside.

Clevia, northwest of Paramaribo; May 13, 1955, C. F. A. Bruijning; RMNH, reg. no. 13027: male, preserved in alcohol, skull inside.

Welgedacht C, south of Paramaribo; between May 18 and May 28, 1955, C. F. A. Bruijning; RMNH, reg. nos. 13005-13008: four females, dried skins and skulls; reg. nos. 13012, and 13014-13018: six males, dried skins and skulls; reg. nos. 13028-13033: six males, preserved in alcohol, skulls inside; reg. nos. 13050-13056: seven females, preserved in alcohol, skulls inside.

Verlengde Pad van Wanica, south of Paramaribo; between June 18 and June 20, 1955, C. F. A. Bruijning; RMNH, reg. no. 13009: female, dried skin and damaged skull; reg. nos. 13034-13043: ten males, preserved in alcohol, skulls inside; reg. nos. 13057 and 13058: two females, preserved in alcohol, skulls extracted.

Paramaribo; June 25, 1955; C. F. A. Bruijning; RMNH, reg. no. 13010: male, dried skin and skull.

Description. — E. Geoffroy (1805a, p. 279 [error pro 379]; 1805b, p. 155); Temminck (1826, vol. 1, pp. 231-232: *Dysopes alecto*; pl. xx: animal, dorsal view; pl. xxiii figs. 23-26: skull; 1841, vol. 2, pp. 355-356: *Dysopes alecto*); Dobson (1876, pp. 209-210: *M. rufus*; 1878, pp. 410-411: *M. rufus*); Miller (1907a, pp. 260-261; fig. 49: skull of *M. rufus*); Miller (1913a, p. 88: *M. rufus*); Vieira (1942, pp. 434-436: *M. rufus*; fig. 40: animal, ventral view); Goodwin (1960); Goodwin & Greenhall (1961, pp. 286-288; fig. 112: head, front view; fig. 113: skull, left side view; pl. 35 figs. 1-3: skull). The original description by E. Geoffroy (1805a) is extremely short: "Pelage noir, lustré seulement en-dessus"; in his "Mémoire", however, E. Geoffroy (1805b, p. 155) gave a more extensive description: "Pelage noir; lustré seulement en dessus. Longueur du corps, om,070 (2 p. 7 lig.); — de la queue, om,040 (1 p. 6 lig.); — de la membrane interf. om,019 (9 lig.). Son museau est plus effilé que dans l'espèce précédente [*Molossus rufus*]: ses oreilles sont sensiblement plus grandes et surtout plus hautes".

Externally *Molossus ater ater* closely resembles *M. molossus,* but it is much larger in all its dimensions. In 42 males from Suriname the length of the forearm varies from 47.8 to 52.7 mm, in 39 females from 46.7 to 50.0 mm. Two colour phases occur, the one reddish brown, the other glossy blackish; in both phases the ventral surface is a shade lighter than the dorsal.

Dental formula: $\frac{1.1.1.3}{1.1.2.3}$ Skull and teeth very similar to *M. molossus,* but much larger. The height of the sagittal crest varies in the males from about 1.5 to 2.5 mm, in the females from about 0.8 to 1.5 mm.

The external and skull measurements of ten specimens from Suriname are given in Table XXXI.

Remarks. — In the original description of *Dysopes alecto,* which is a junior synonym of *Molossus ater ater,* Temminck (1826, vol. 1, p. 232) noted that the species occurs in "les parties inférieures du Brésil", and that (probably as far as known to him) specimens were present only in the Leiden Museum. Since Jentink in his 1887 and 1888 catalogues mentioned only one type specimen of Temminck's species, it seems likely that Temminck's description is solely based on this single specimen; if my presumption is correct the Leiden Museum specimen is the holotype of the species. If Temminck had more specimens at hand, which he sent later to other museums, I consider the Leiden Museum specimen to be the lectotype. In his supplement to the genus *Molossus,* Temminck (1841, vol. 2, p. 355) noted that he had obtained "de Surinam un grand nombre d'individus dans différents états d'âge" of his *Dysopes alecto;* apparently these specimens were sent to him by H. H. Dieperink.

After examination of the Suriname specimens of *Molossus rufus* mentioned by Jentink (1887, p. 288; 1888, p. 200) it proves that Jentink's 1887 skull no. e actually belongs to *Eumops auripendulus auripendulus* (Shaw), while his 1888 specimens nos. g, h, i, and j belong to *Eumops geijskesi* nov. spec., and his nos. l, m, and o to *Molossus molossus* (Pallas).

The coat colour of the Suriname specimens of *Molossus ater ater* examined by me is subject to some variation. For instance, the specimen reg. no. 13005 has a shiny black dorsal surface, on the ventral surface a very faint dark brown tinge is visible; in reg. no. 13008 the dorsum is dark brown to blackish and the ventral surface is dark brown. In reg. no. 13009, the dorsum is dark brown, contrasting strongly with the rufous ventral surface. In reg. no. 13010 the dorsal surface is dark brown, the ventral surface being light brown with the exception of the chin and the area surrounding the gular sac, which are whitish as in *Molossus molossus* (Pallas). Miller (1913a, p. 88) stated that the blackish phase of the species is apparently rare, the reddish brown phase being common. I found the opposite to be true in my Suriname material, which originates mainly from the Paramaribo region.

All specimens brought together by Dr. C. F. A. Bruijning were collected in sheds, stables, houses, and other buildings.

As mentioned under *M. molossus* (see page 254) it is possible that Sander-

TABLE XXXI

External and skull measurements of ten specimens of *Molossus ater ater* E. Geoffroy from Suriname.

Museum		RMNH	RMNH	ZMH	RMNH	RMNH	RMNH	ZMA	ZMA	RMNH	RMNH
Reg. number		12999	12998	38862b	13002	13003	13001	1632	1636	13008	13007
Sex		♂	♂	♂	♂	♂	♀	♀	♀	♀	♀
Forearm		51	49.5	50.7	49.8	52.5	47.0	49.0	47.0	49.5	50.5
Third digit,	metacarpal	52	52	50.5	50	52.5	49	50	48	51	50.5
	1st phalanx	23.5	23	22.5	23	24	21	22	21	23	23
	2nd phalanx	20.5	20	19.5	19	20	19	19	17	20	19
	3rd phalanx	4.5	4	4	4	4	4	4	4	4	4
Fourth digit,	metacarpal	51	50.5	50.5	49	51	47	49	46.5	50	49
	1st phalanx	21	19.5	19.5	18.5	20	19	19	18	20	19
	2nd phalanx	8	6	5.5	6	5	6	5	5	4	4
Fifth digit,	metacarpal	31.5	31	32	32	32	30	30.5	29	31.5	31
	1st phalanx	13.5	12	13	11.5	12	12	12.5	11.5	13	12.5
	2nd phalanx	8.5	7	7	7	8	7	7	6.5	7	7
Tibia		18	19	19	19	20	17	17	18	—	—
Hind foot		11	11	11	12	11	11	10.5	11	—	—
Tail		53	50	53	52	60	47	45	51	55	54
Skull:											
greatest length		21.4	21.6	22.6	23.2	24.0	19.1	20.0	20.8	21.6	22.0
condylobasal length		19.8	19.7	20.0	20.8	21.1	17.7	18.2	18.8	19.9	20.2
condyle to front of canine		19.8	19.7	19.8	20.8	21.1	17.6	18.2	18.8	19.5	19.7
basal length		17.1	17.1	18.1	18.1	18.2	15.3	15.8	16.6	17.3	17.5
palatal length		8.1	8.1	8.2	8.1	8.4	7.0	7.2	7.4	7.9	7.7
zygomatic breadth		13.1	12.9	14.2	14.6	15.0	11.6	12.0	13.7	14.0	13.3
breadth of braincase		10.0	9.8	11.5	11.2	11.6	9.6	9.8	10.7	10.7	10.5
height of braincase, without crest		7.7	7.5	7.6	8.1	7.9	7.0	7.5	7.3	7.6	7.3
mastoid breadth		12.6	12.8	14.0	14.8	14.6	11.3	11.6	12.8	13.4	13.1
interorbital constriction		3.9	3.7	4.5	4.2	4.6	3.7	3.9	4.1	4.4	4.2
width across molars		9.3	9.1	10.3	10.2	10.5	8.5	8.8	10.0	10.3	10.0
width across cingula canines		5.6	5.4	6.3	6.0	6.5	5.0	5.3	5.4	5.8	5.6
upper tooth-row, c - m^3		8.2	8.2	8.2	8.3	8.4	7.6	7.8	7.8	8.2	8.0
lower tooth-row, c - m_3		9.3	9.4	9.1	9.2	9.5	8.6	8.6	8.4	9.6	9.0
length of mandible		15.1	15.1	15.5	16.1	16.6	13.2	13.8	14.7	15.1	15.1

son's (1939, p. 221) account of "Molossus" actually dealt with the present species.

The holotype (or lectotype?) of *Dysopes alecto* Temminck is still present in the Leiden Museum under reg. no. 13023. The dried skin is in a rather good condition, slightly bleached so that the dorsal surface of the body is no longer "d'un noir très-brillant et lustré", as described by Temminck, but blackish brown; the skull is damaged (see plate XXX). The following measurements were taken of this specimen: length of forearm, 52.5; skull, greatest length, 22.2; palatal length, 8.1; zygomatic breadth, 14.6; breadth of braincase 11.2; interorbital constriction, 4.5; width across molars, 10.4; width across cingula canines, 6.2; upper tooth-row, c-m^3, 8.3; lower tooth-row, c-m_3, 9.4; length of mandible, 16.0. All these values fall within the range of variation of the corresponding measurements of the Suriname *Molossus ater* given in Table XXXI.

Though Sanborn (1949b, p. 284) gave no reasons for his action, he undoubtedly was quite correct when citing the original description of Geoffroy's species of the genus *Molossus* as from the Bulletin des Sciences, par la Société Philomatique, Paris, vol. 3, no. 96, pp. 278-279 [error pro 378-379], instead of from the Annales du Muséum d'Histoire Naturelle, Paris, as given by previous authors. According to the date mentioned on the title page of no. 96 of the "Bulletin" this number was published in "Ventôse, an 13 de la République", i.e., between February 20 and March 21, 1805; according to Sherborn (1914, p. 366) Geoffroy's paper in the "Annales" was published in May 1805, the paper in the "Bulletin" consequently has priority.

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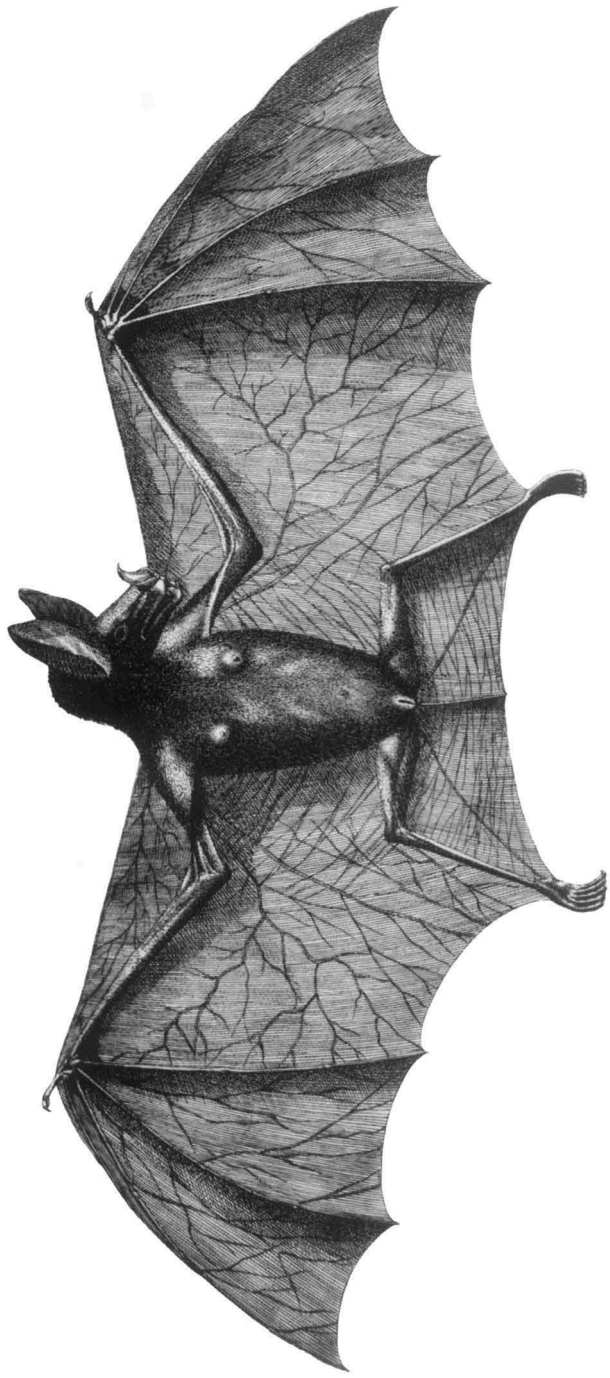
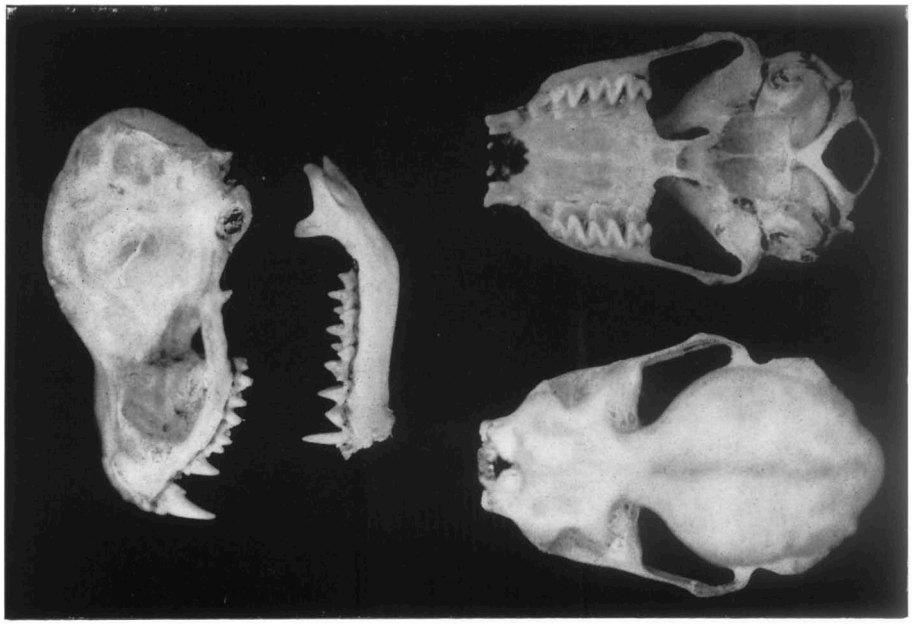
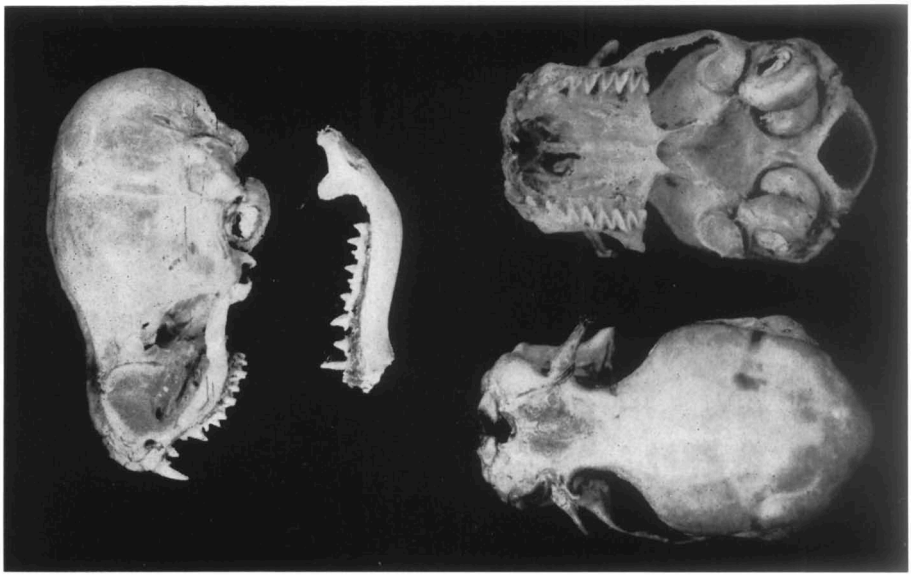
PLATES I—XXX



Canis volans, maxima, aurita [= *Vampyrum spectrum* (L.)]. After Seba, 1734, pl. lviii fig. 1. 1/3 × original size.



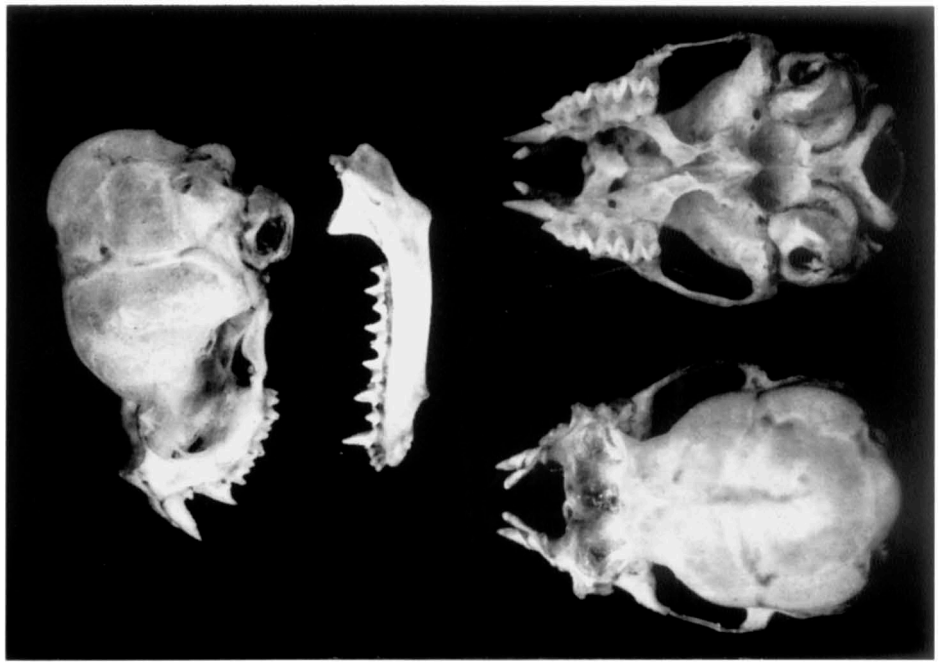
Saccopteryx bilineata (Temminck), SMN, Nr. 1176a, 3.



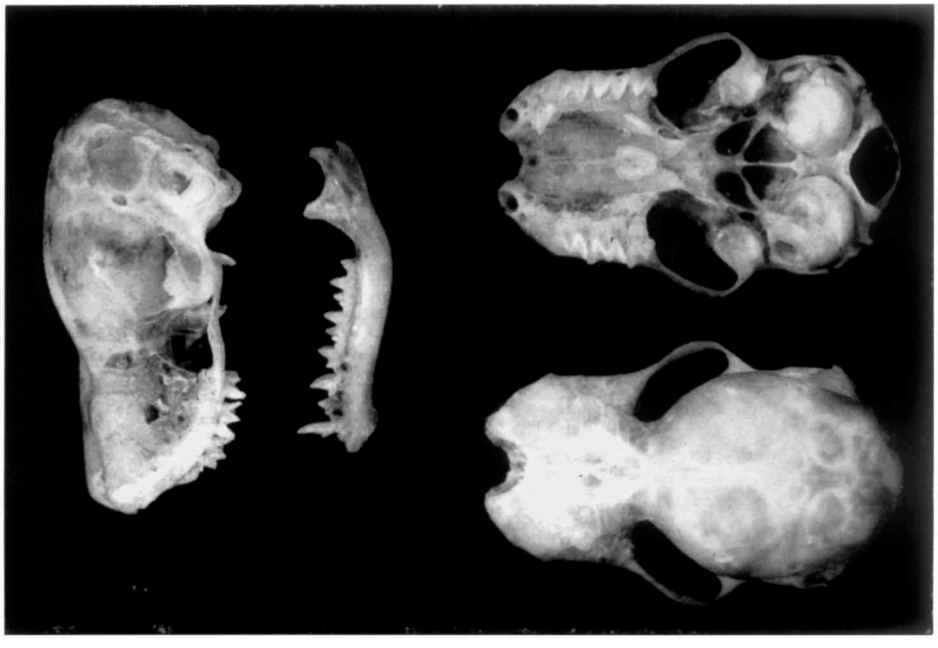
Rhynchonycteris naso (Wied), SMN, Nr. 264b-370, e.

Cormura brevirostris (Wagner), RMNH, reg. no. 2031, 2.

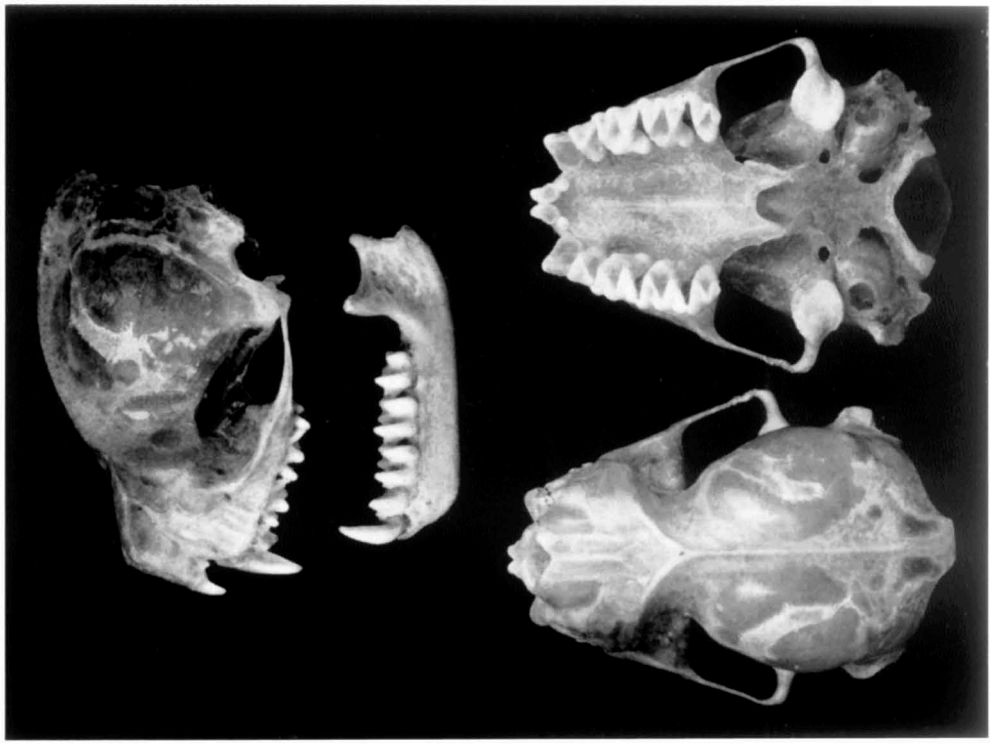
Saccopteryx leptura (Schreber), ZMB, Nr. 3982.



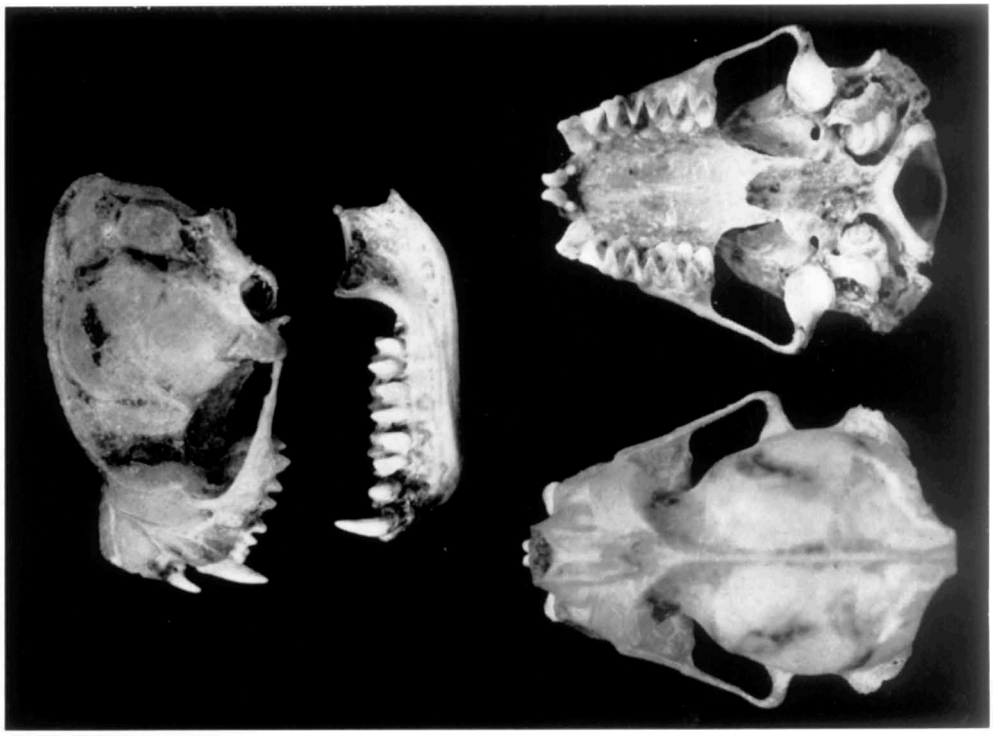
Diclidurus scutatus Peters, ZMA, no. 1625.



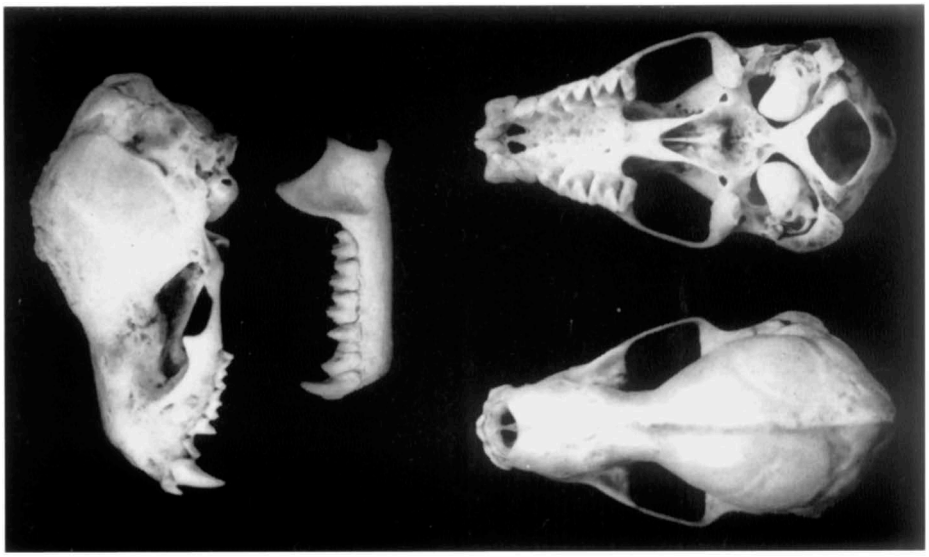
Centronycteris maximiliani maximiliani (Fischer), RMNH, reg. no. 12111.



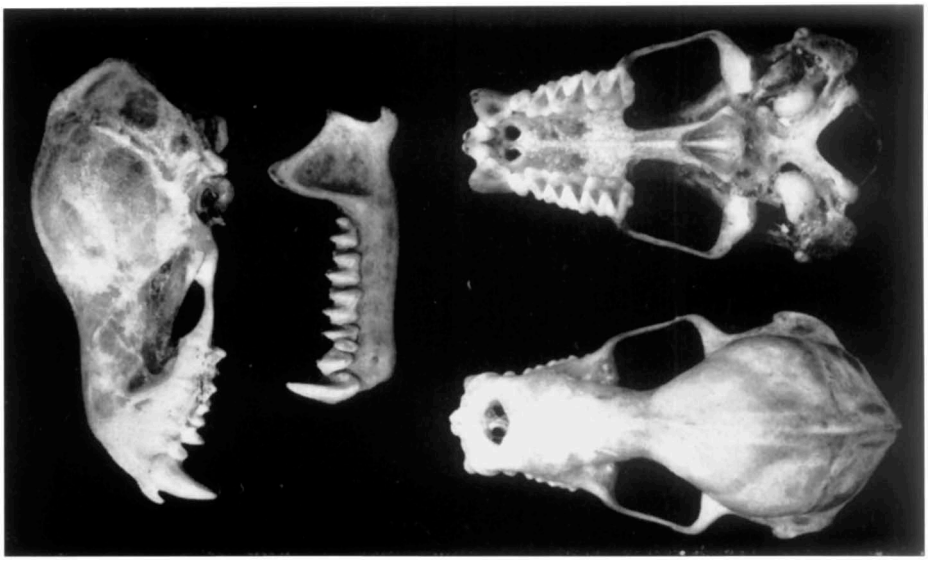
Noctilio leporinus leporinus (L.), RMNH, reg. no. 12003.



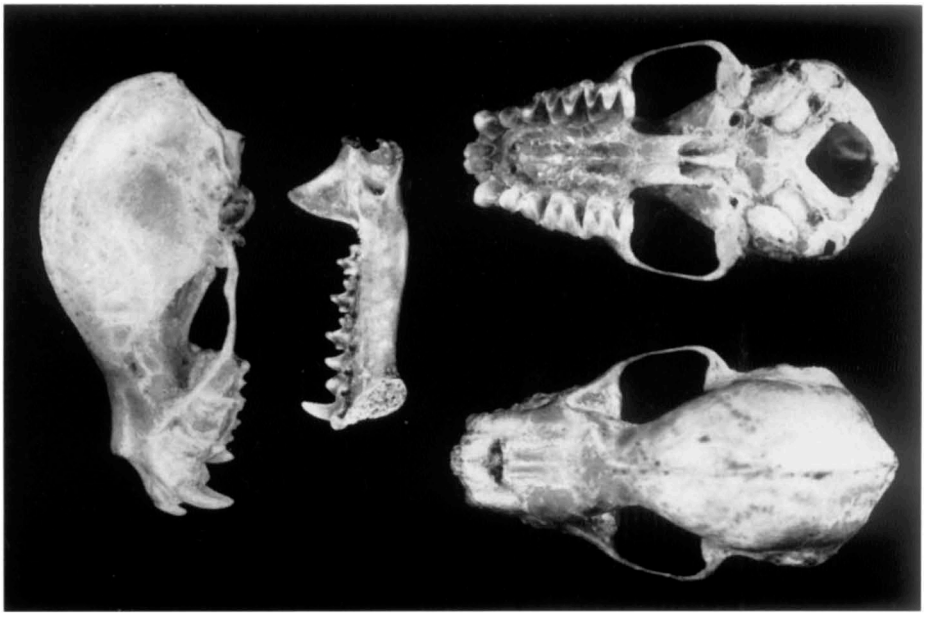
Noctilio labialis albiventris Desmarest, RMNH, reg. no. 17296.



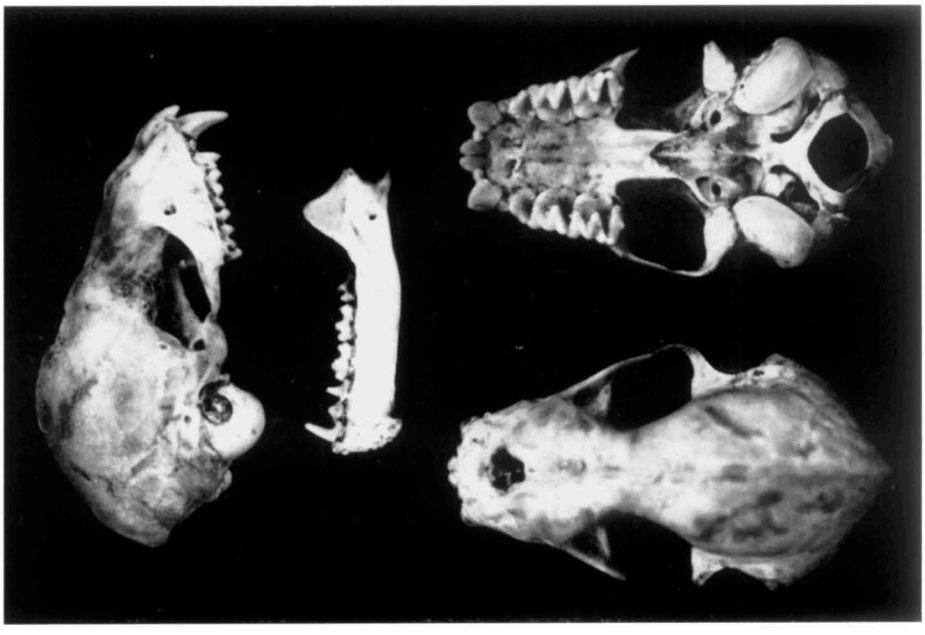
Tonatia carrikeri (J. A. Allen), ZMB, Nr. 4234.



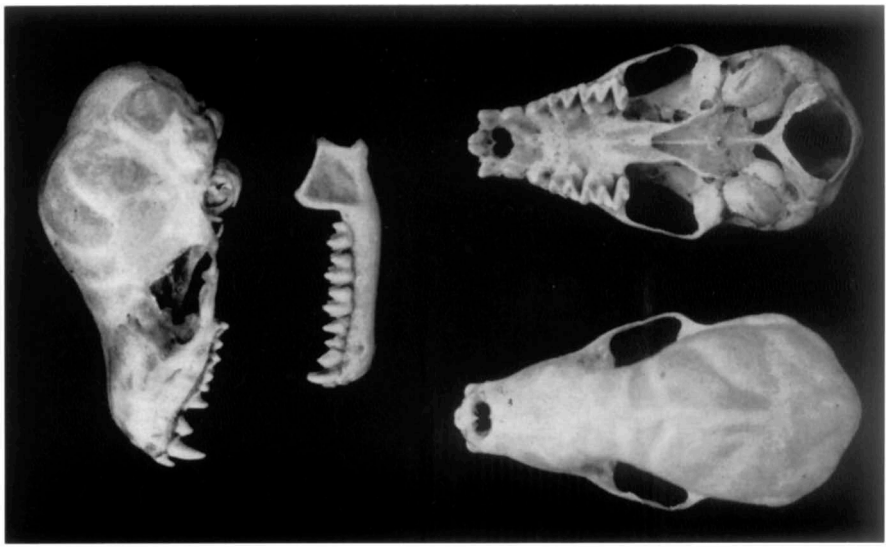
Tonatia silvicola laephotis Thomas, RMNH, reg no. 15786.



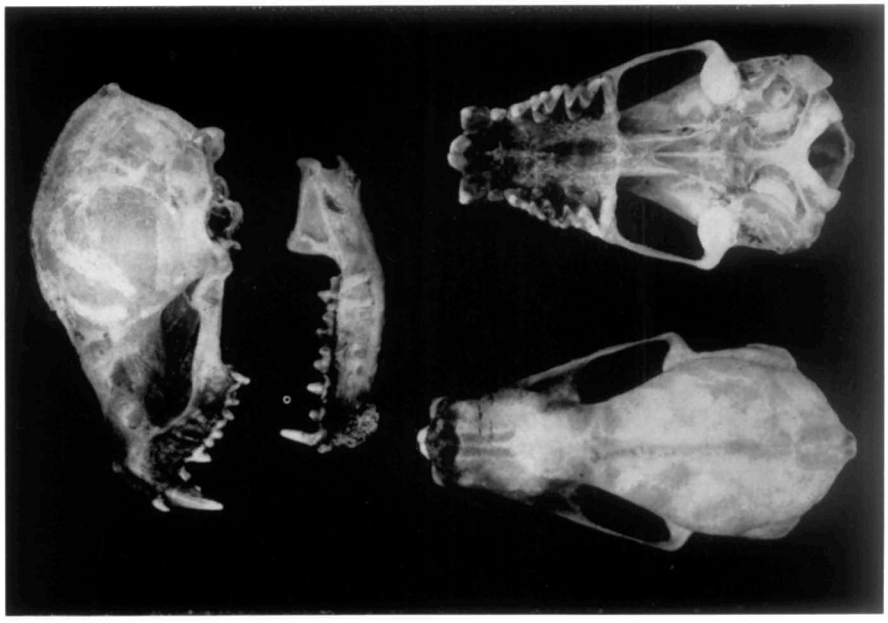
Mimon bennettii Gray, ZMB, Nr. 3350a.



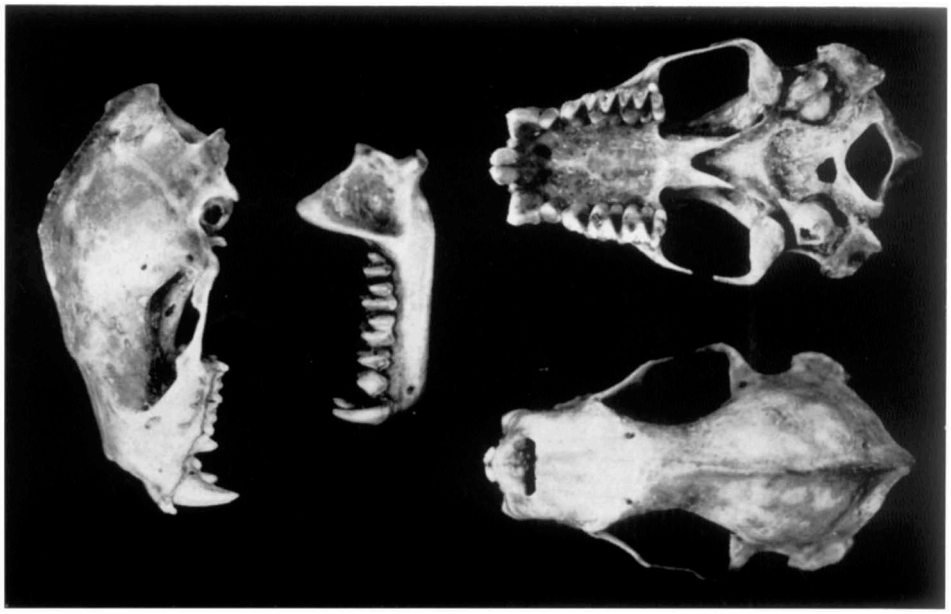
Anthorhina crenulata (E. Geoffroy), RMNH, reg. no. 12089.



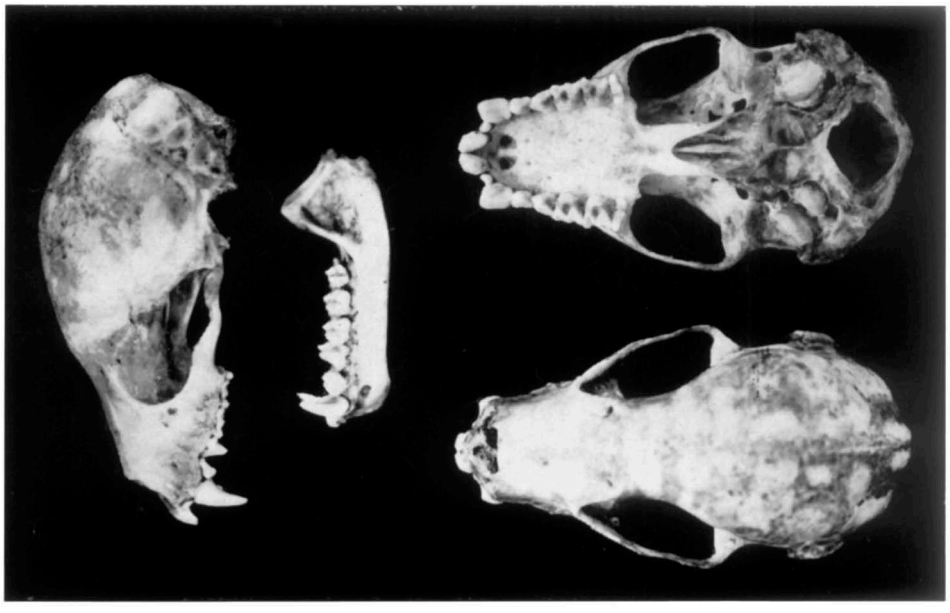
Micromycteris megalotis megalotis (Gray), ZMB, Nr. 4265b.



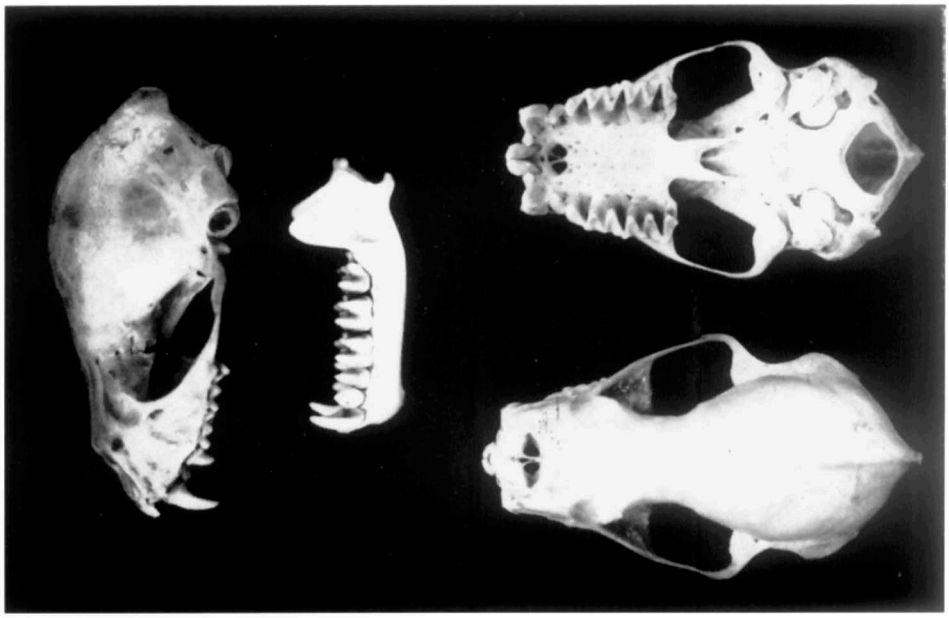
Trachops cirrhosus cirrhosus (Spix), RMNH, reg. no. 13127.



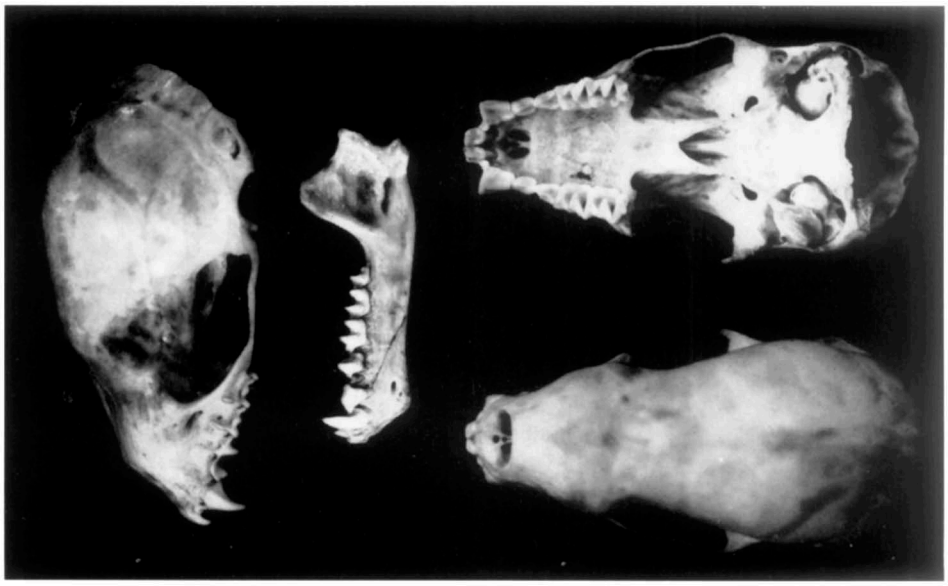
Phyllostomus hastatus hastatus (Pallas), RMNH, reg. no. 15887.



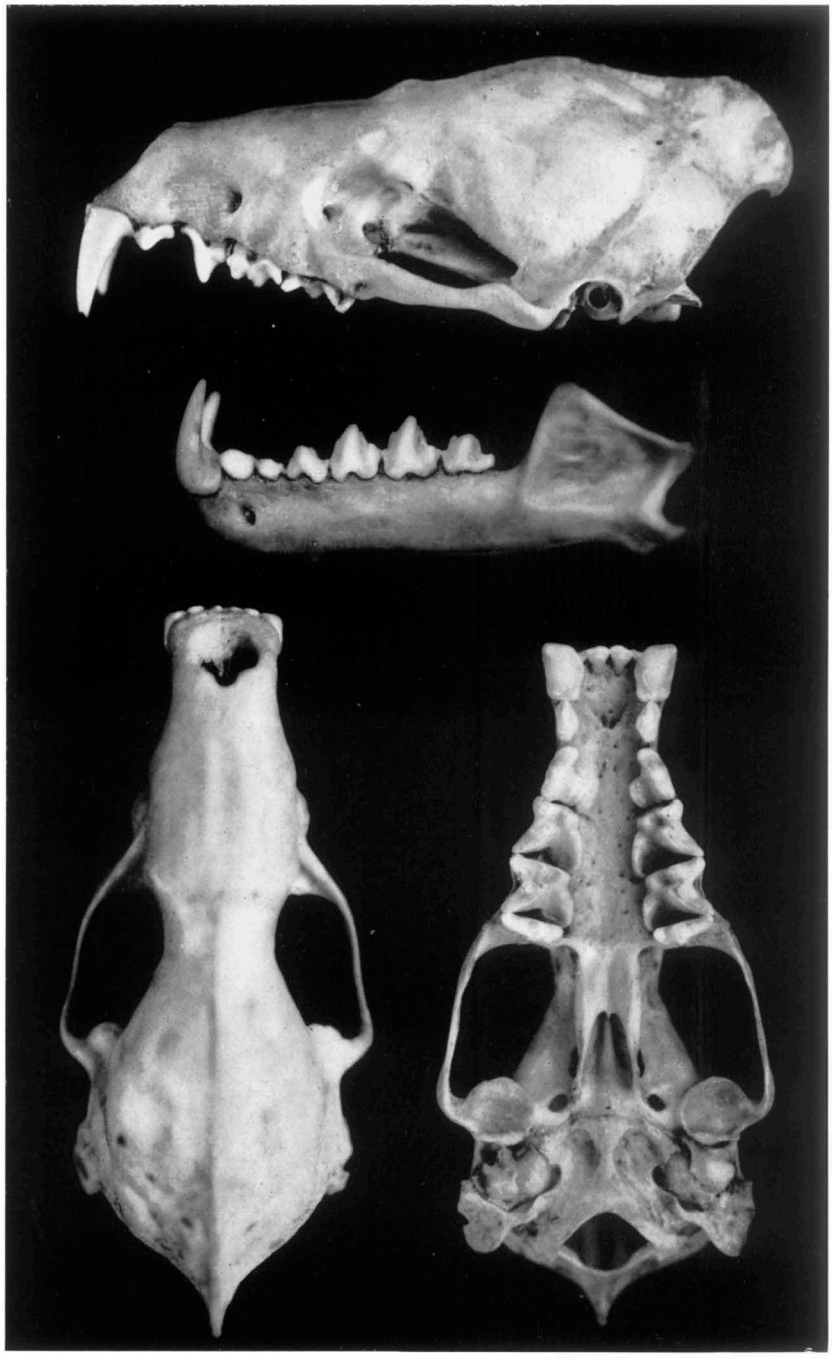
Phyllostomus discolor discolor (Wagner), CNHM. no. 93187.



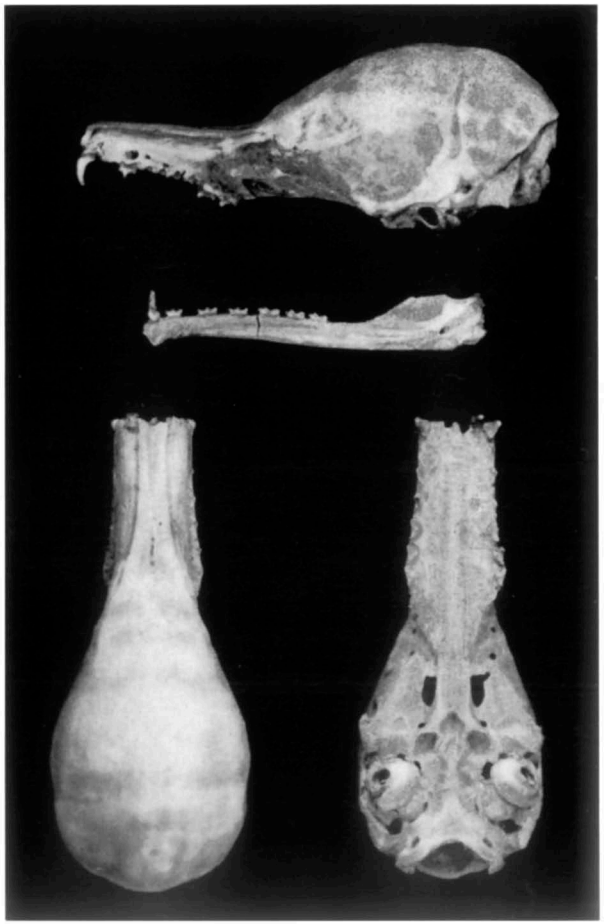
Phyllostomus elongatus (E. Geoffroy), ZMB, Nr. 3217.



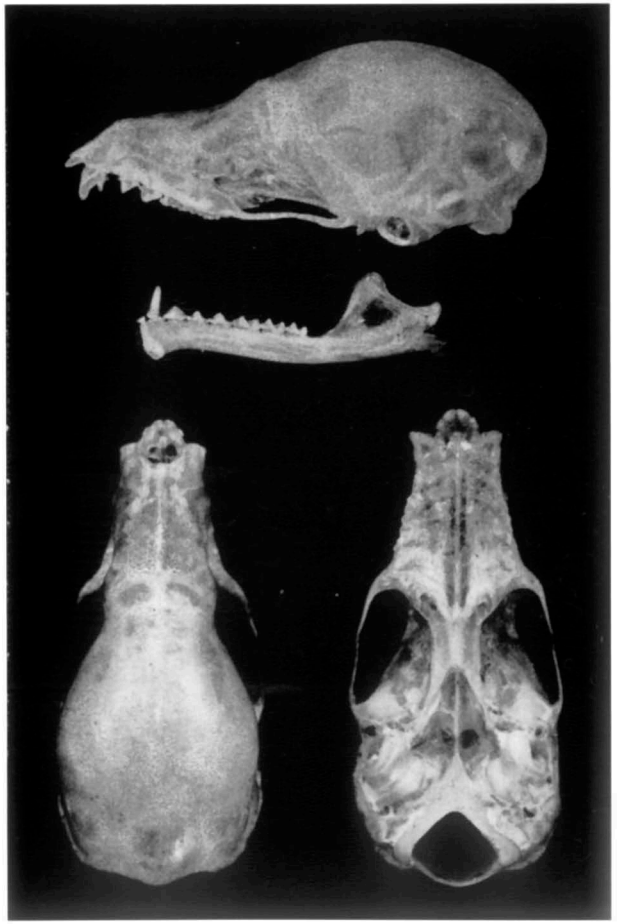
Phylloderma stenops (Peters), holotype, RMNH, reg. no. 16843.



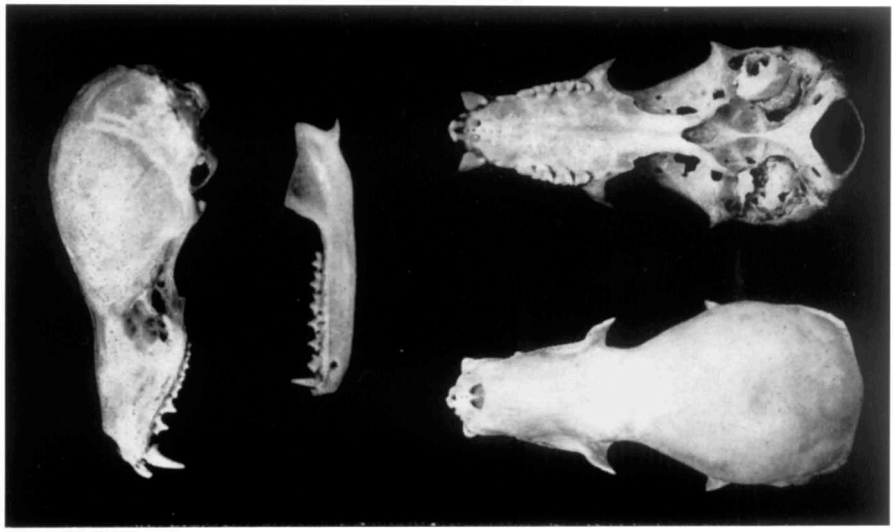
Vampyrum spectrum (L.), RMNH, reg. no. 15909.



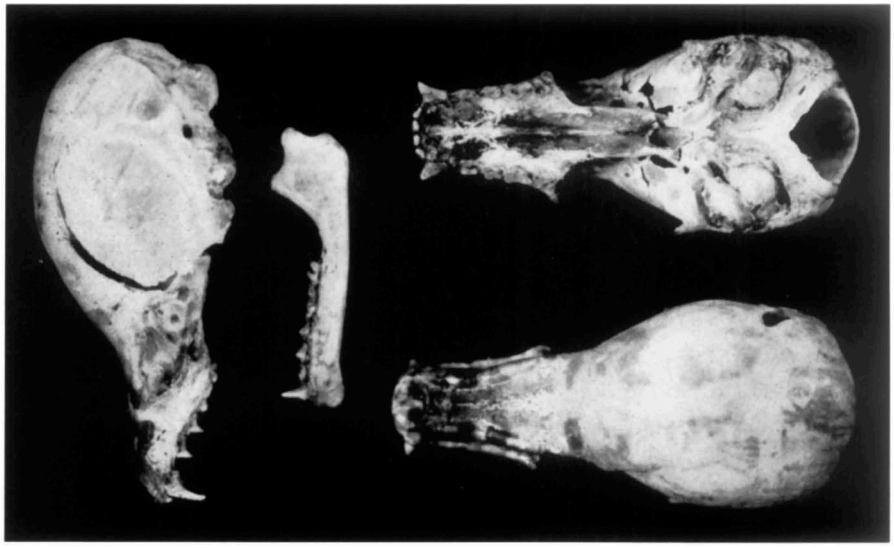
Choeronycteris minor Peters, holotype, SMN, Nr. 441 [= *Choeroniscus minor* (Peters)].



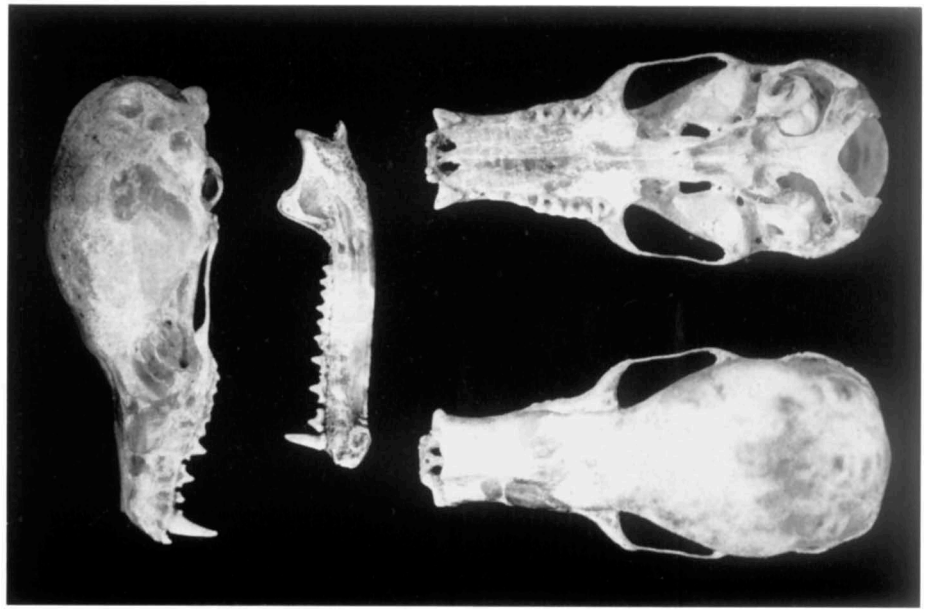
Glossophaga soricina soricina (Pallas), RMNH, reg. no. 13505.



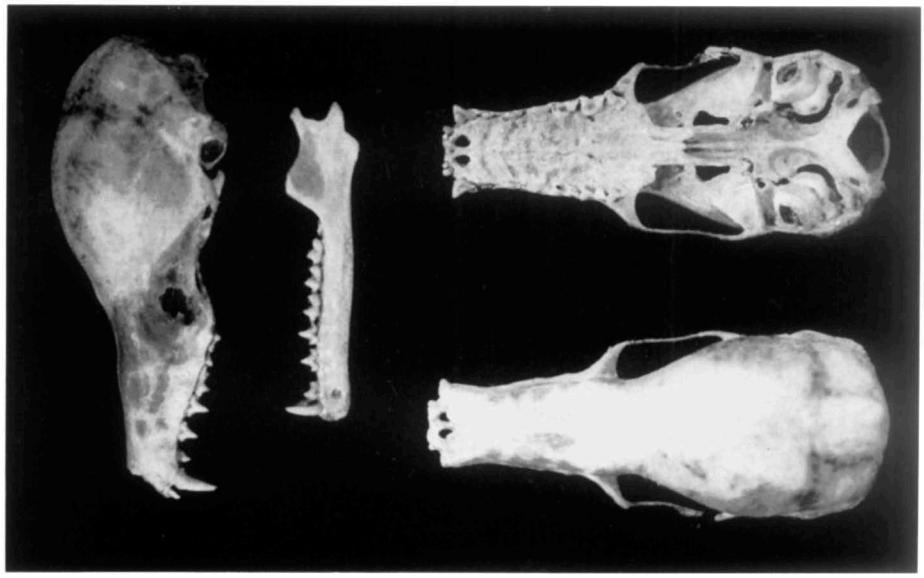
Lonchophylla thomasi J. A. Allen, SMN, Nr. 264, 1410b.



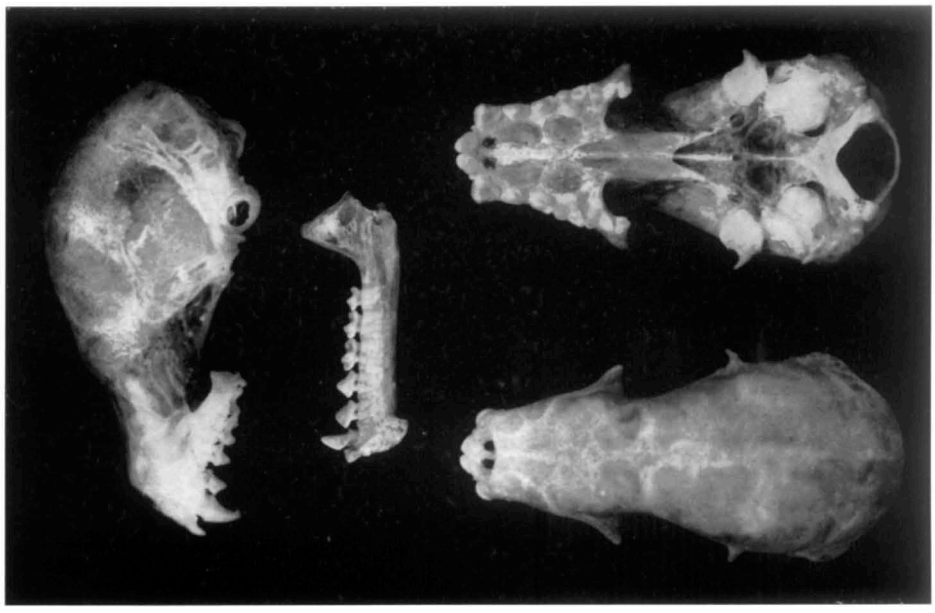
Lichonycteris obscura Thomas, BMNH, no. 96.10.1.20.



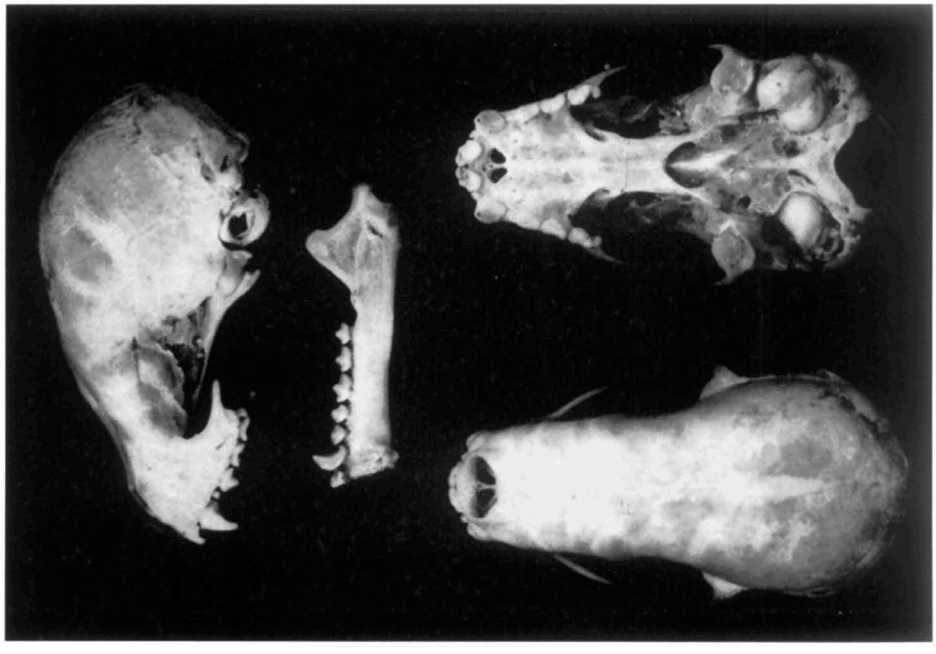
Anoura geoffroyi geoffroyi Gray, RMNH, reg. no. 16416.



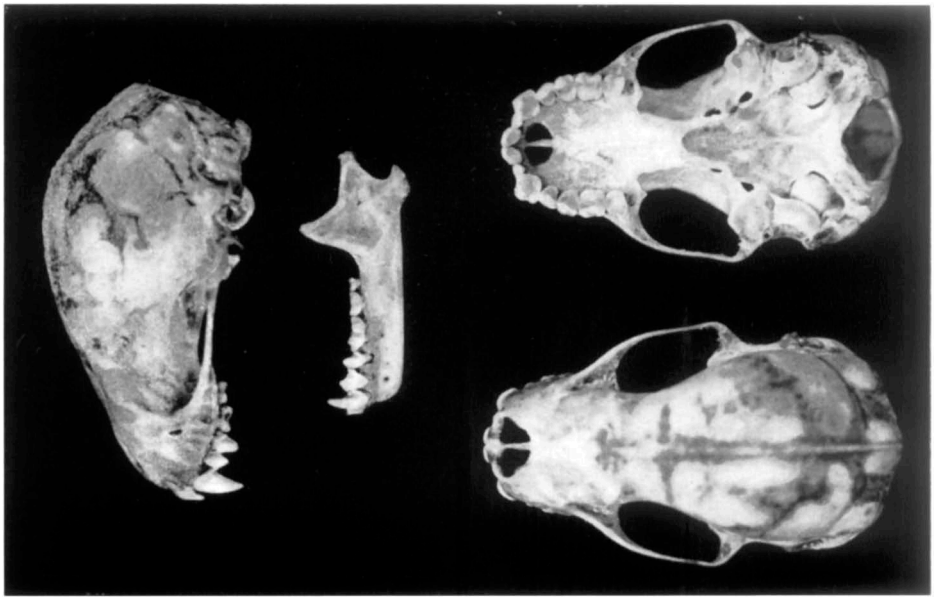
Lonchoglossa caudifer caudifer (E. Geoffroy), RMNH, reg. no. 13487.



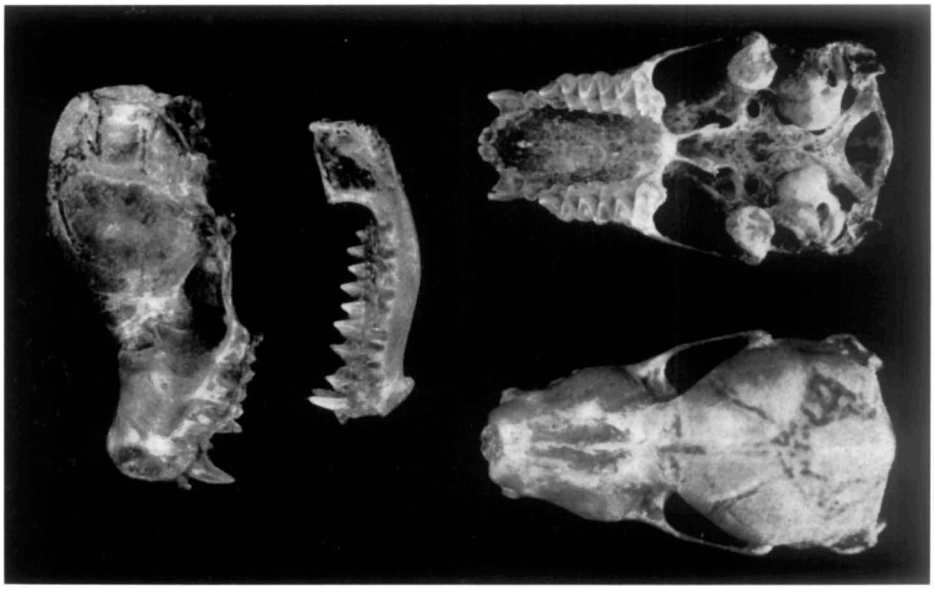
Carollia perspicillata perspicillata (L.), RMNH, reg. no. 12085.



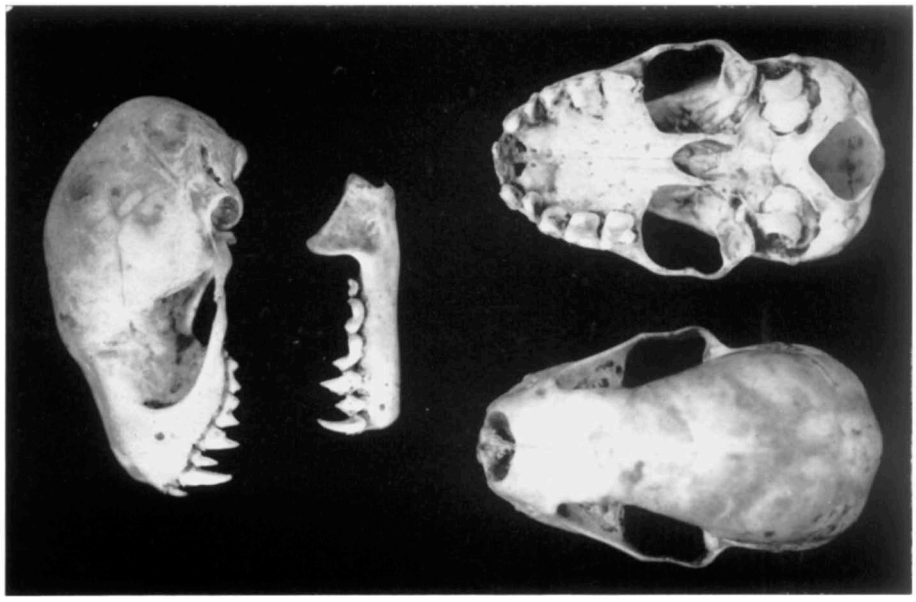
Rhinophylla pumilio Peters, SMN, Nr. 289,1.



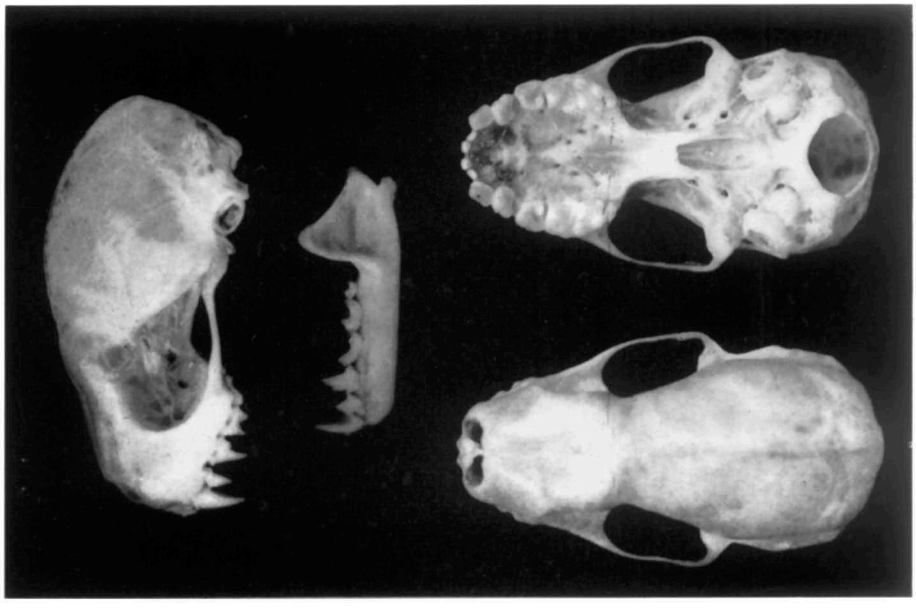
Sturnira lilium lilium (E. Geoffroy), CNHM, no. 93206.



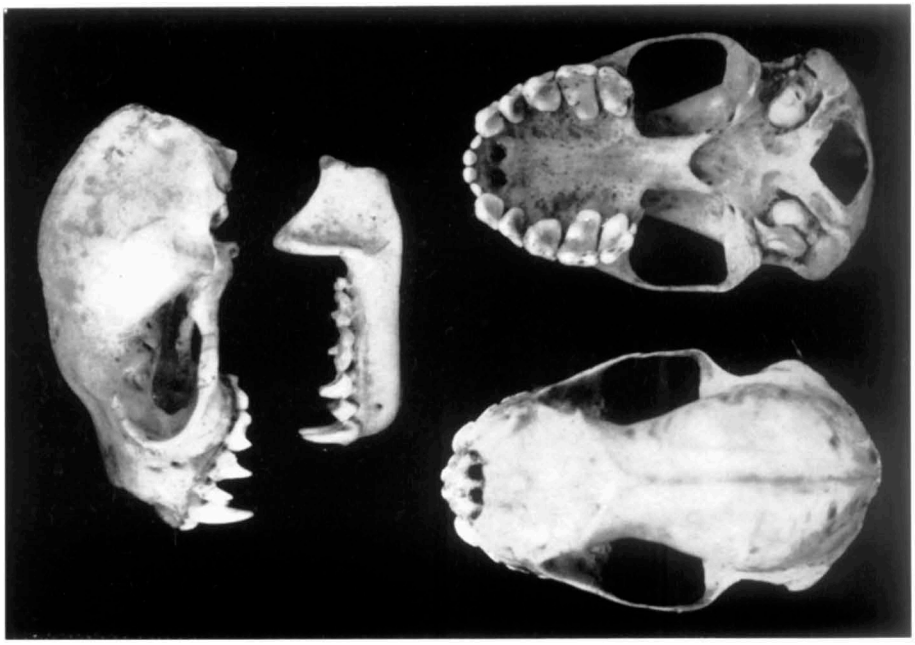
Chilonycteris rubiginosa rubiginosa Wagner, RMNH, reg. no. 16420.



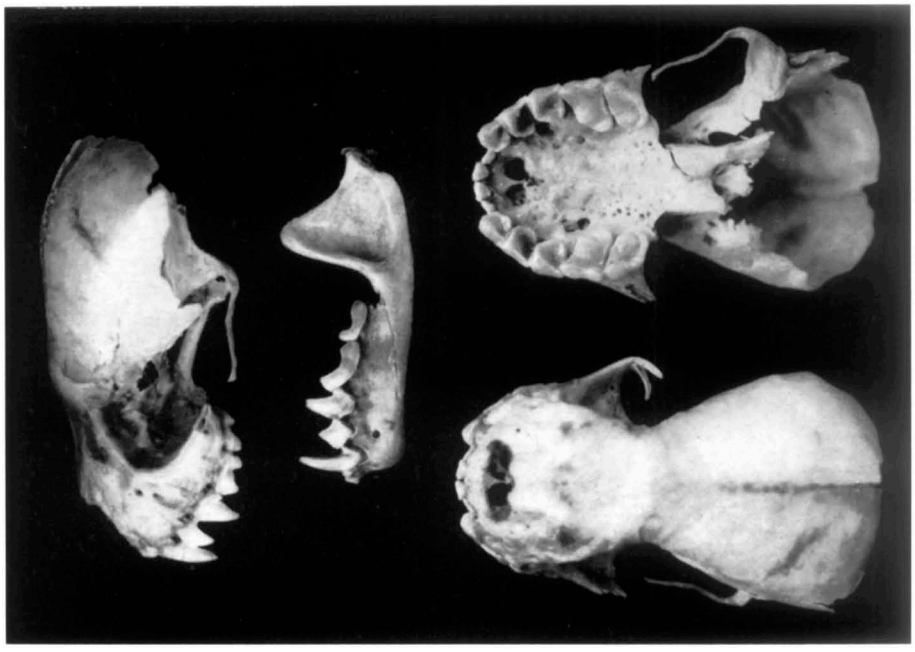
Vampyrops helleri Peters, RMNH, reg. no. 12087.



Uroderma bilobatum bilobatum Peters, RMNH, reg. no. 13080.

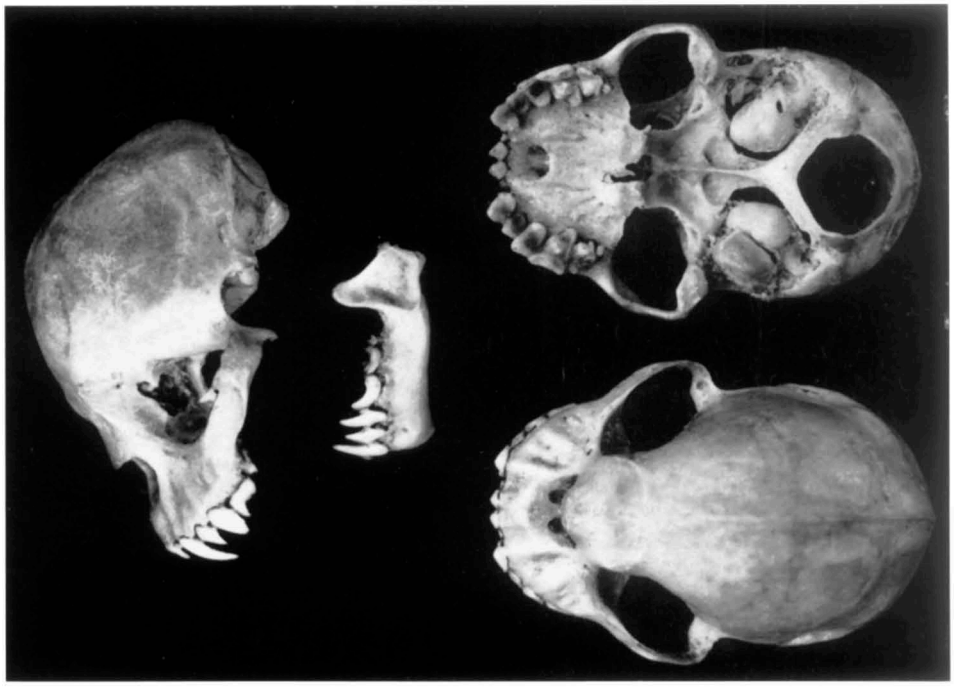


Artibeus fallax Peters, lectotype, RMNH, reg. no. 13083

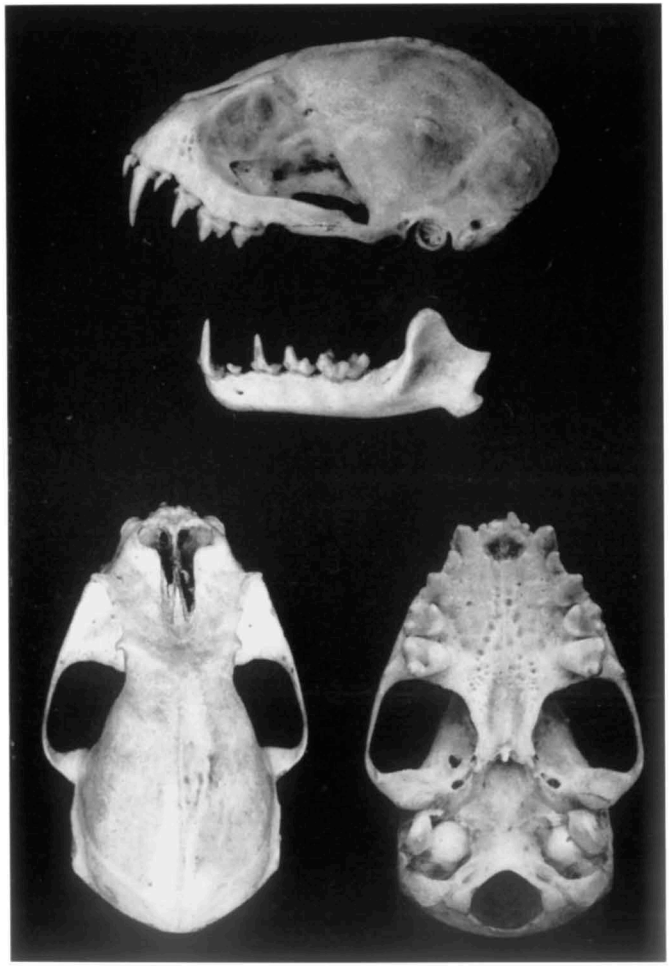


Artibeus quadrivittatus Peters, holotype, RMNH, reg. no. 13114.

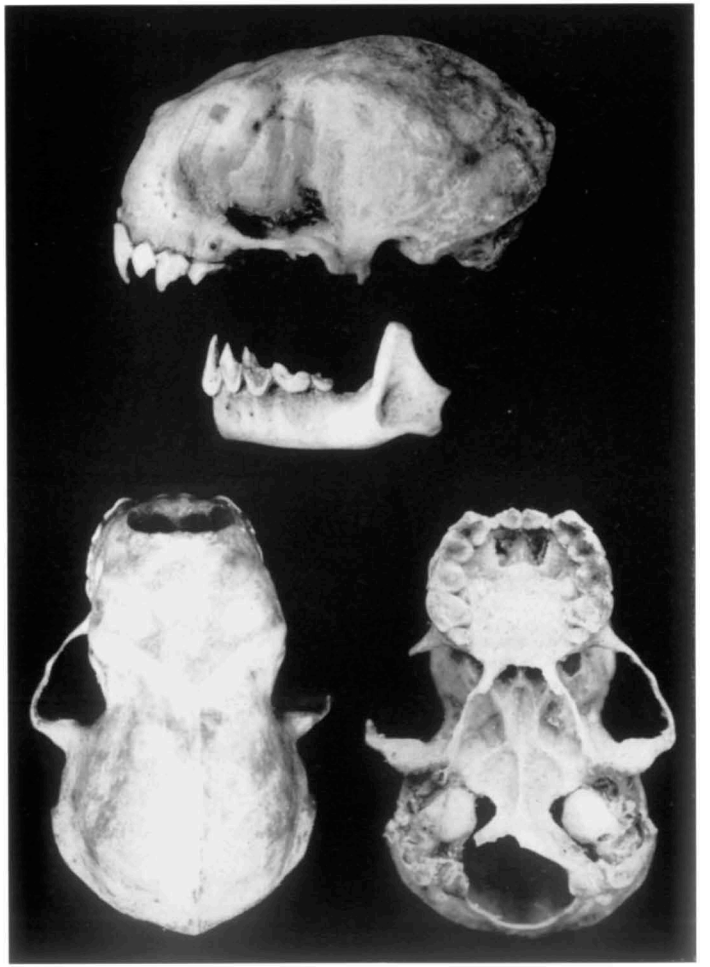
Ametrida minor H. Allen, CNHM, no. 93204.



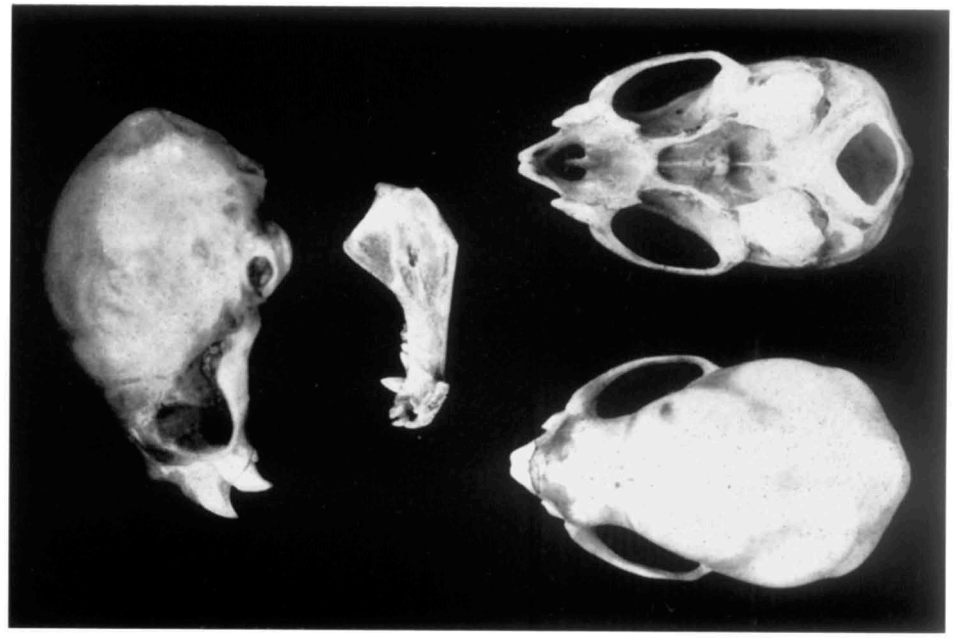
Ametrida centurio Gray, SMN, Nr. 1633.



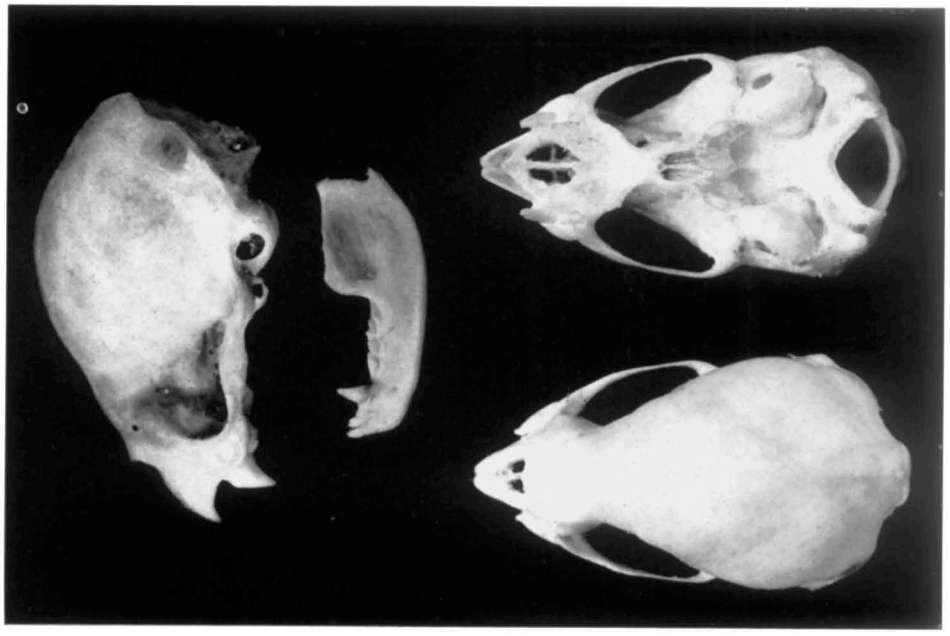
Chiroderma villosum Peters, SMN, Nr. 1450.



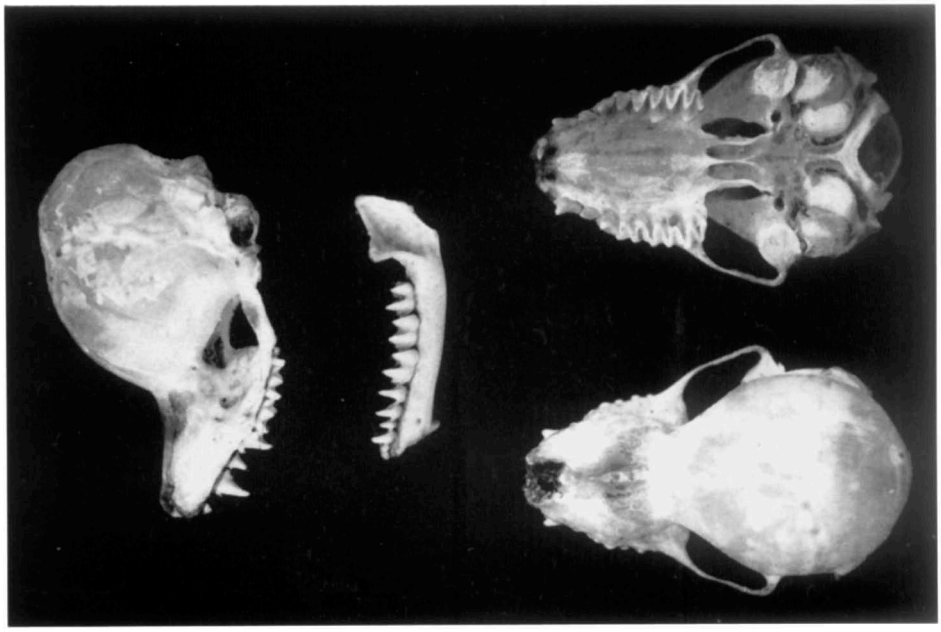
Pygoderma bilabiatum (Wagner), RMNH, reg. no. 17391.



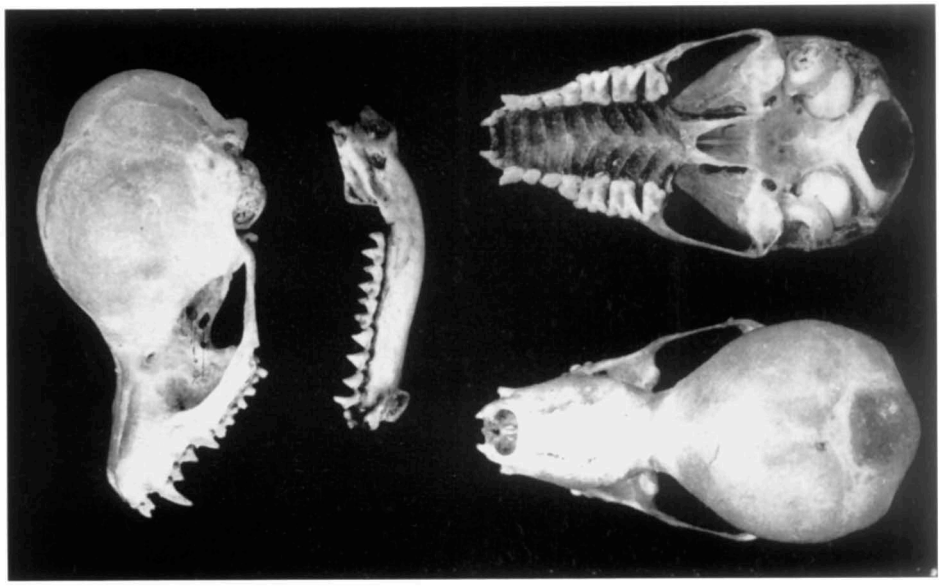
Desmodus youngii Jentink, holotype, RMNH, reg. no. 12088 [= *Diaemus youngii youngii* (Jentink)].



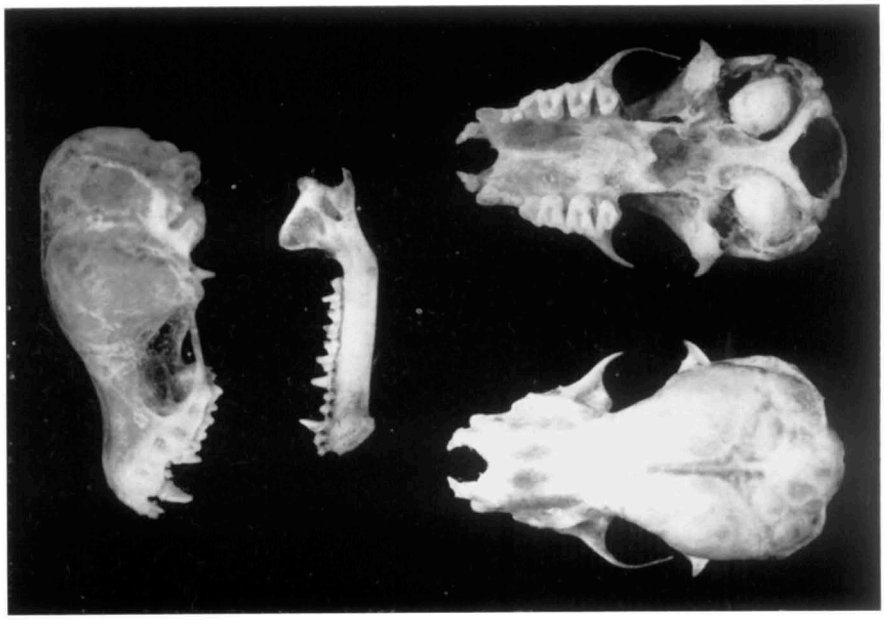
Desmodus rotundus rotundus (E. Geoffroy), SMN, Nr. 3538,1.



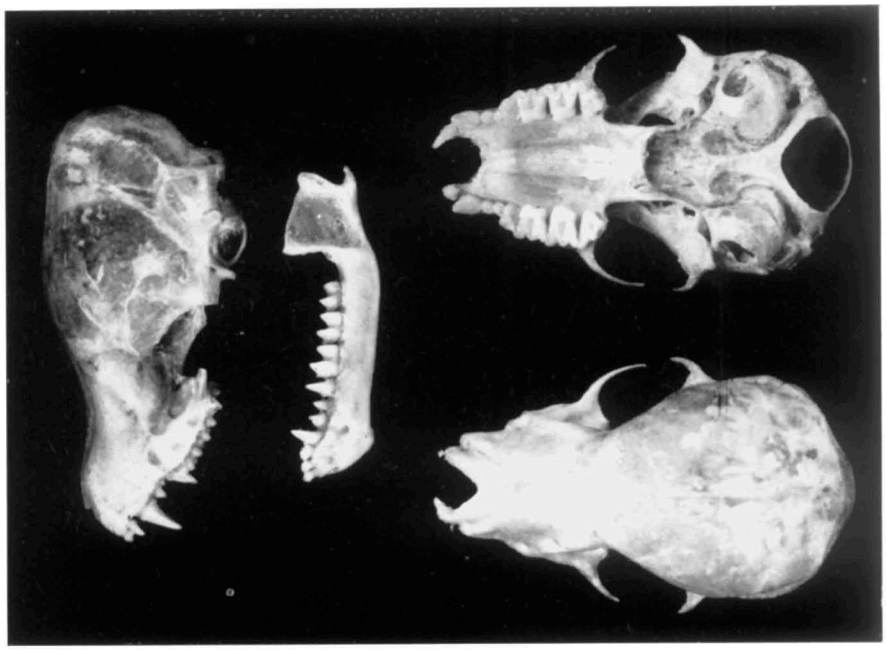
Furipterus horrens (F. Cuvier), RMNH, reg. no. 13488.



Thyroptera tricolor tricolor Spix, SMN, Nr. 1301,3.

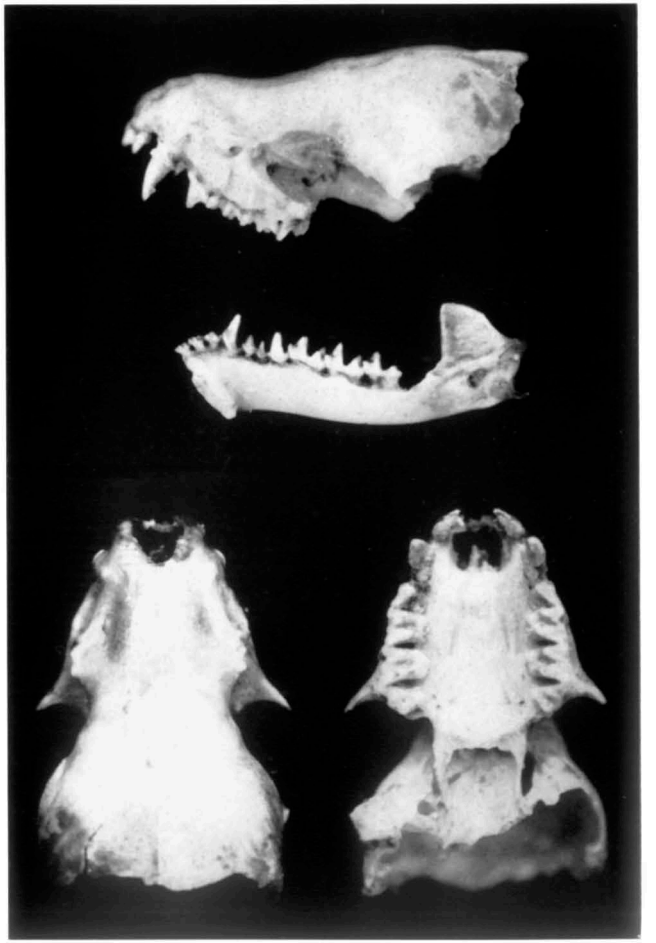


Myotis nigricans nigricans (Schinz), RMNH, reg. no. 17103.

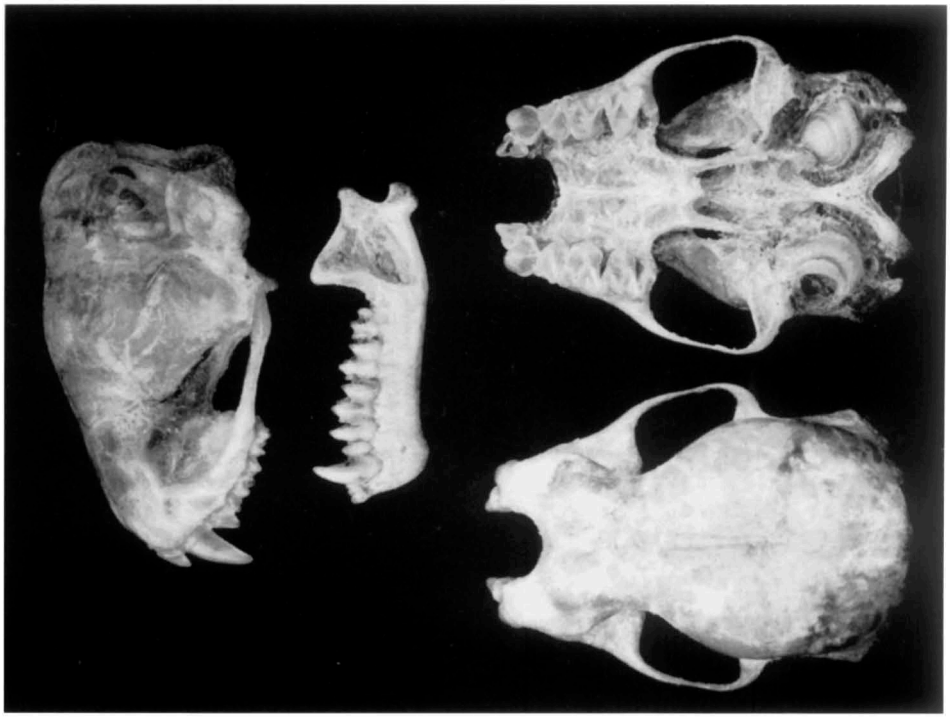


Myotis albescens (E. Geoffroy), SMN, Nr. 2642, 861½,2.

Eptesicus melanopterus (Jentink), SMN, Nr. 264a.



Vespertilio ferrugineus Temminck, holotype, RMNH, reg. no. 17363 [= *Myotis surinamensis* nov. nom.].

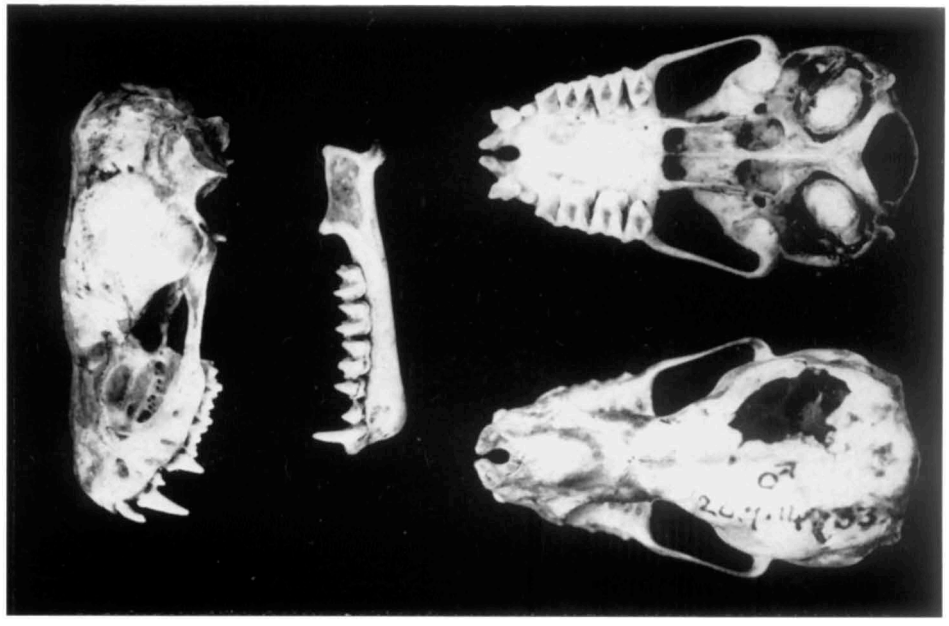


Dasypterus ega ega (Gervais), RMNH, reg. no. 17371.

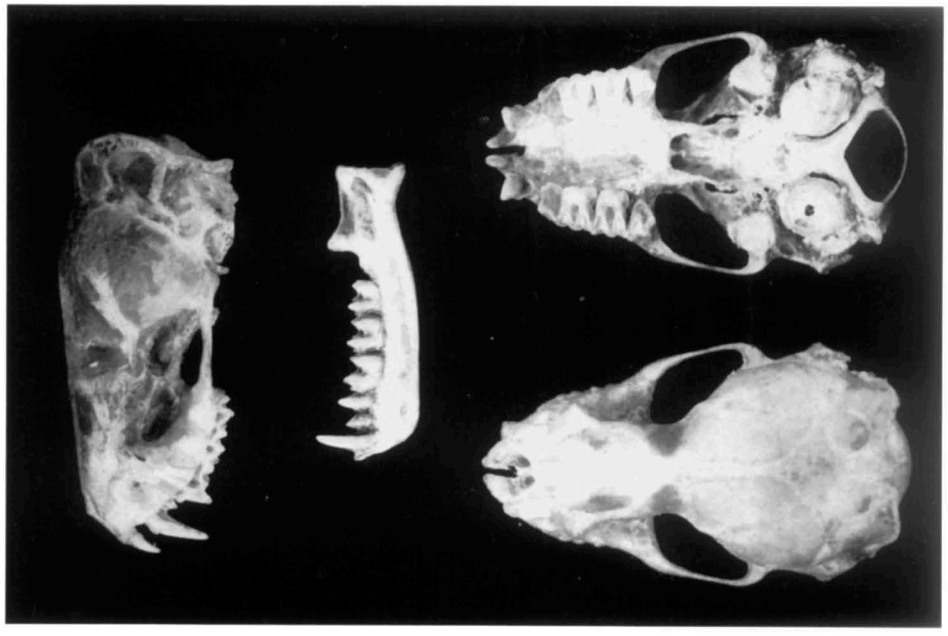
Lasiurus borealis frantzii (Peters), RMNH, reg. no. 17282.

Dysopes abrasus Temminck, holotype, RMNH, reg. no. 17374 [= *Cynomops abrasus* (Temminck)].

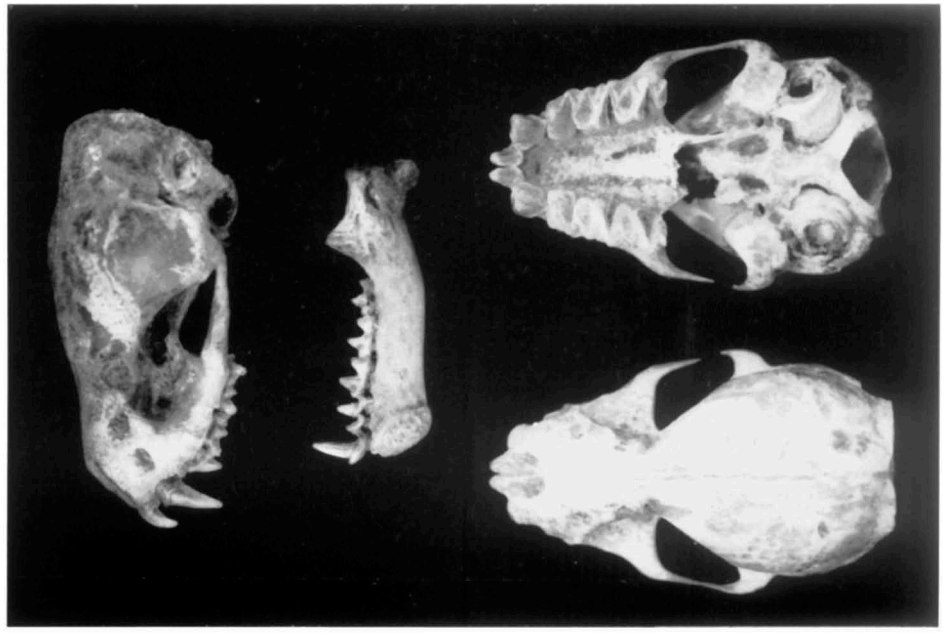
Cynomops planirostris planirostris (Peters), RMNH, reg. no. 12900.



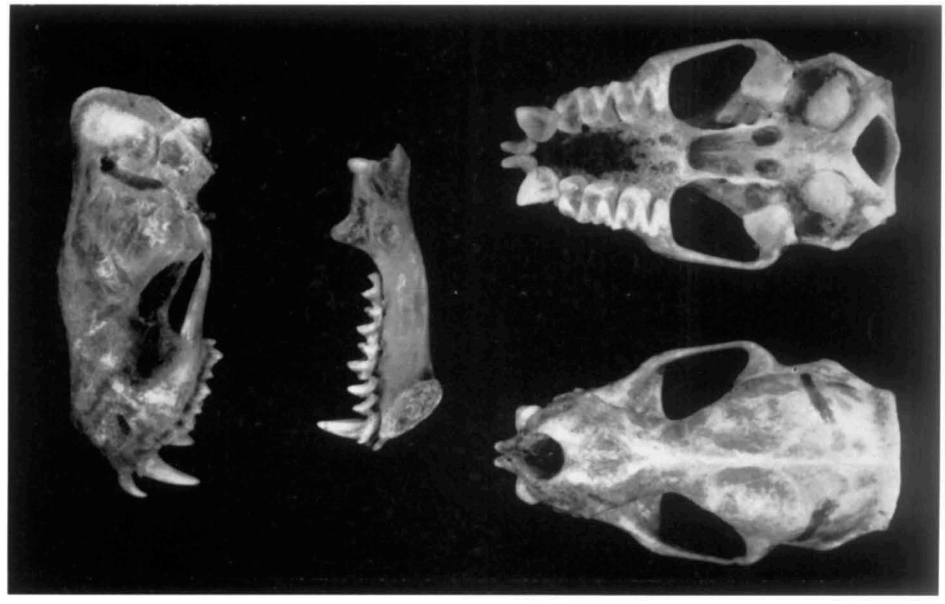
Tadarida macrotis (Gray), BMNH, no. 20.7.14.33.



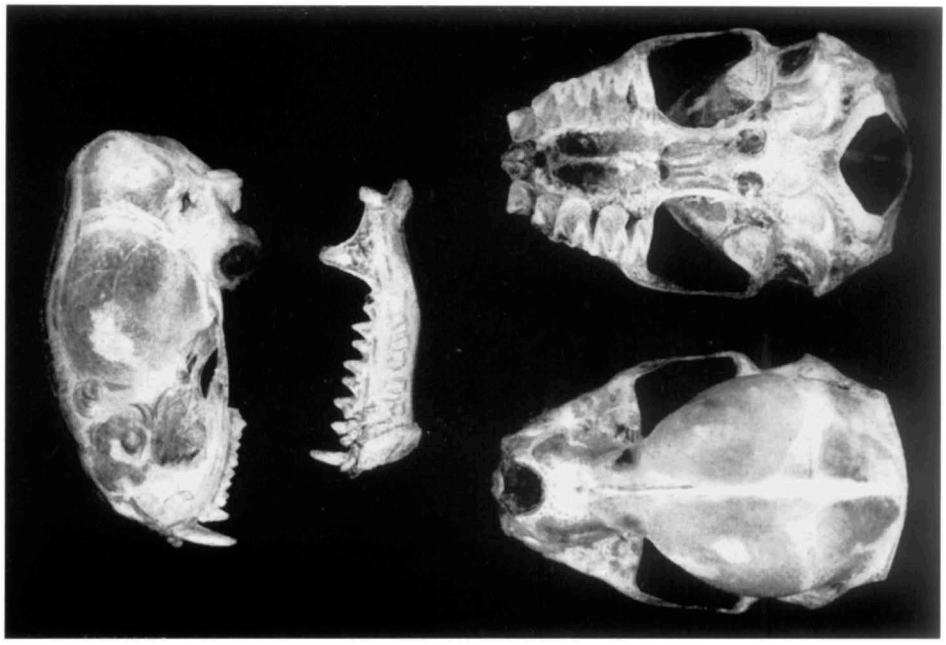
Tadarida europs (H. Allen), RMNH, reg. no. 15919.



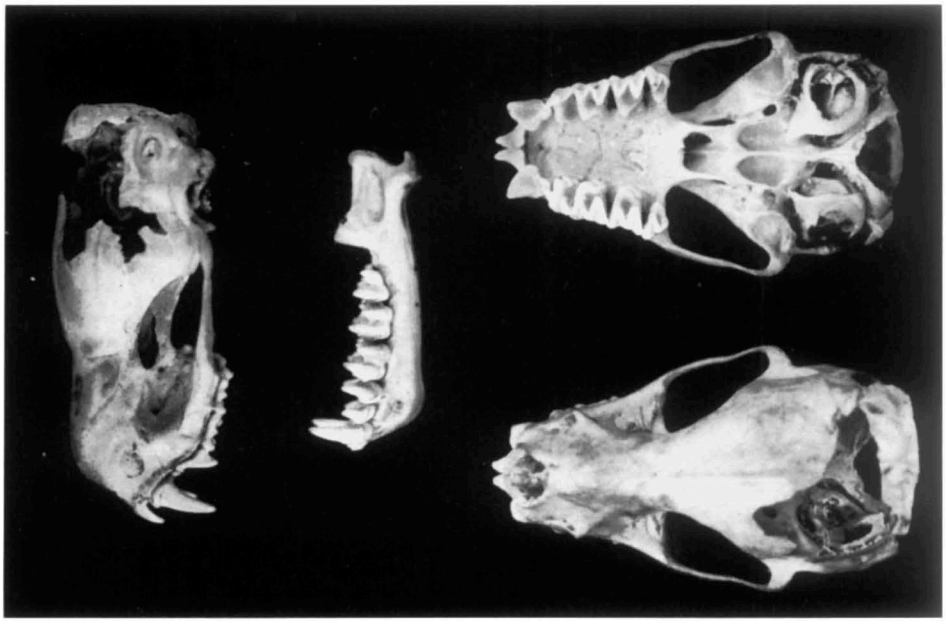
Eumops geijskesi nov. spec., holotype, RMNH, reg. no. 12943.



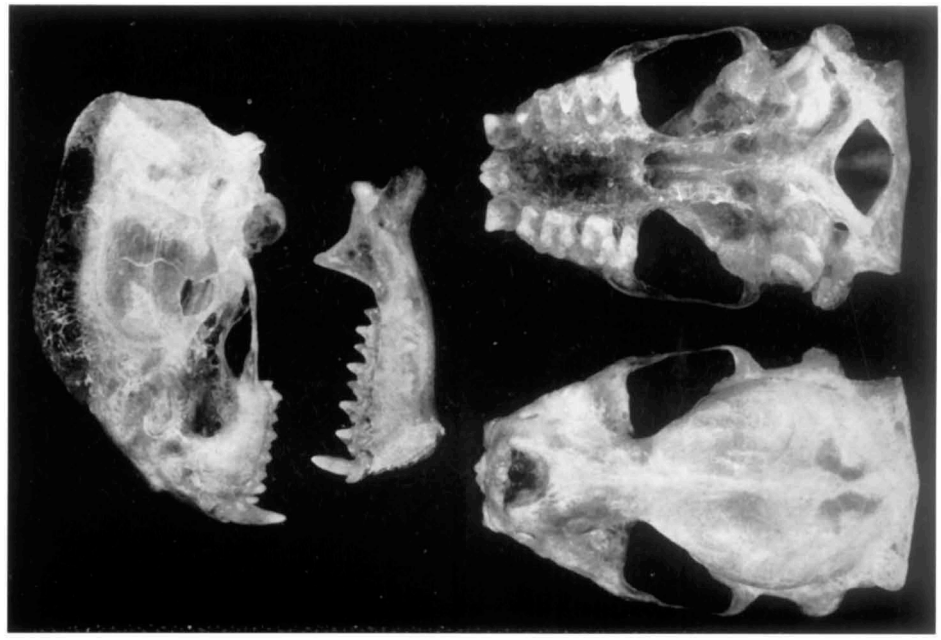
Eumops auripendulus auripendulus (Shaw), RMNH, reg. no. 12907.



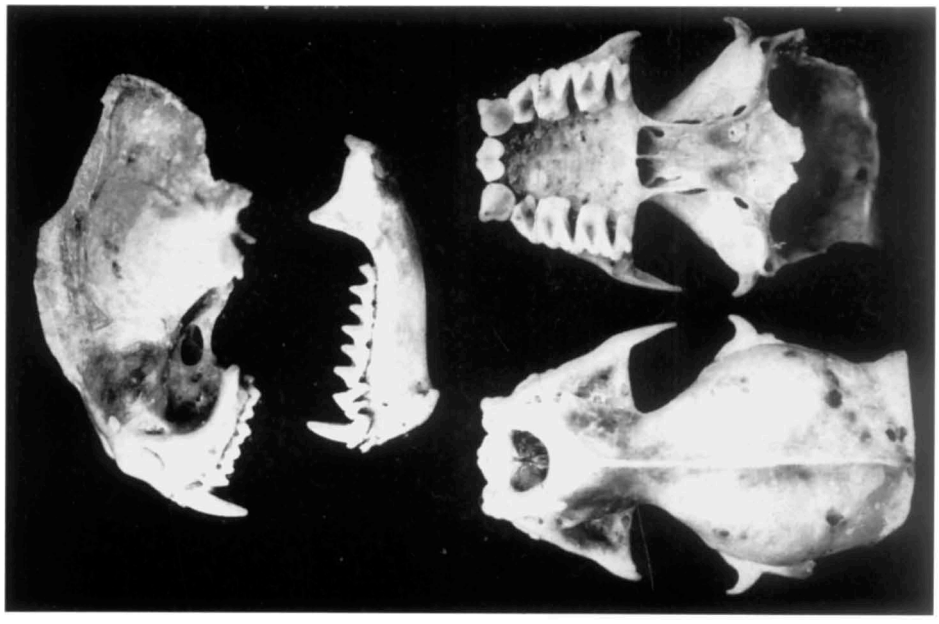
Molossus molossus (Pallas), RMNH, reg. no. 12997.



Eumops trumbulli (Thomas), SMN, Nr. 293.



Molossus ater ater E. Geoffroy, RMNH, reg. no. 13002.



Dysopes alecto Temminck, holotype, RMNH, reg. no. 13023 [= *Molossus ater ater* E. Geoffroy].